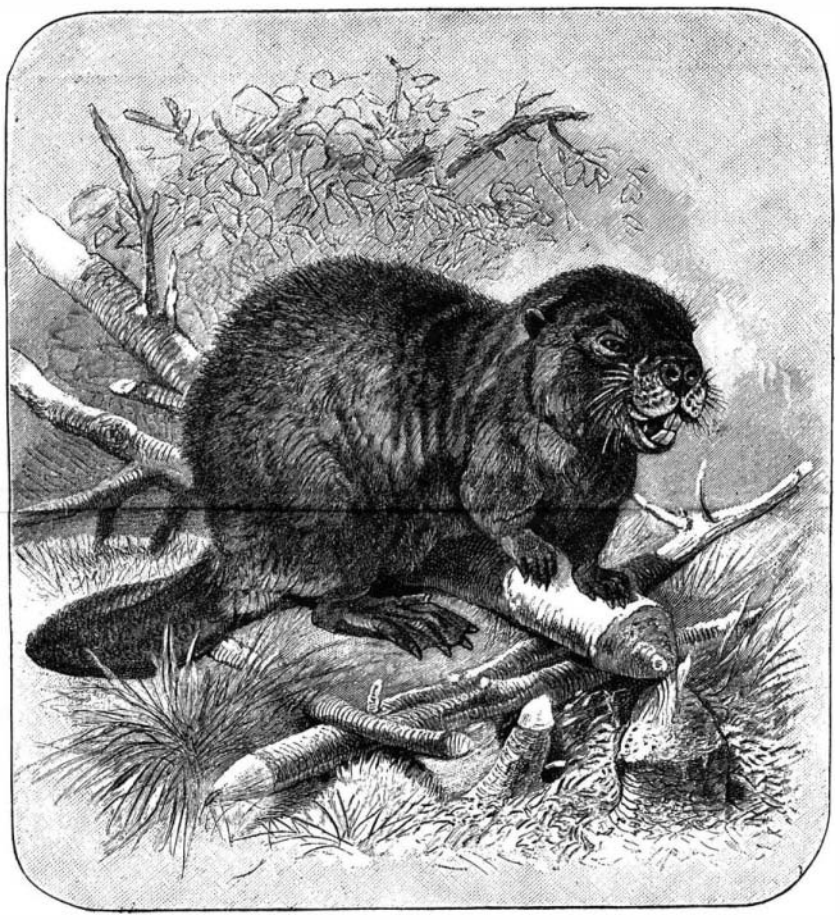
THE LIFE AND HABITS OF THE BEAVER.

Our engraving shows a rare animal, or rather one that has become rare. While it was formerly widespread and numerous in the temperate and even the colder parts of Europe and Asia, and also of America, it has disappeared quickly wherever it came in contact with human beings, and although so familiar an object years ago, there are now comparatively few people in Europe, especially in Germany, who have had an opportunity of seeing a beaver in its natural state. The land was too highly cultivated, for the rodent requires lonely, uncultivated regions for his home, and he was hunted because he made havoc among the young trees and for the sake of his fur, his meat, which many like, and for the perfume secreted by certain glands of his body, so that beavers, like many other animals, have been decimated.

The beaver is one of the most important rodents. As the body of a full grown male is about 2 feet 7 inches long and weighs about 60 pounds, there are few rodents that surpass him in size; in Europe he has no equal among the rodents. The broad head, somewhat narrowed toward the front, on a short, thick neck, and the stout body, which is wider at the rear, give the animal a clumsy look. The webbed hind feet indicate its amphibious nature, and his tail is of such a peculiar shape that any child could recognize him by it; it is flattened, so that when one looks down upon it, it seems to be egg-shaped, and it is covered with little angular scales. The color of the tail is dark gray, while the thick fur on the animal's back is chestnut brown and that under the body is lighter.

The beaver's chief tools are his very large chisel-shaped teeth, which are very long and prominent. His nose and ears are well adapted for his aquatic life, for the little short ears that are nearly hidden in the fur can be laid so flat on his head as to effectively exclude all water, and in a similar manner the nostrils are closed by thick flaps. For years past busy fancy has added many fables and fairy stories to the accounts of the beaver's life and habits, but these are sufficiently interesting without such additions, especially where he can enjoy undisturbed security.

We must go to lonely parts of Asia or North America, particularly to Canada—the latter has the beaver in its coat of arms—to find large colonies or societies of beavers, for they settle on rivers and streams that run through forests in which the sound of the ax has never been heard, building in their characteristic fashion. Their dome-shaped houses or "lodges," which are sometimes nine feet high, serve as temporary dwellings to be used in case the underground dwellings are flooded. The latter are entered by long tunnels that open in deep water. The neighboring wood furnishes the materials for the "lodges;" even thick trees fall victims of the sharp teeth of the beaver, and are skillfully cut up. The branches and twigs, the bark of which forms his food, are all used for building, being placed one upon the other without regularity; but the beaver, a natural marine architect, saves the thicker stems for a different purpose. If the level of the water in the stream on which he has settled is subject to marked variations, he builds a dam reaching from one bank to the other, these dams often being 650 feet long and several yards thick at the base. The thick logs are driven into the ground and bound together by thinner branches, and then the whole is covered with earth, mud and water plants, forming a scientifically built dam. When a large colony has settled in a safe place in the wilderness regular cities grow up, and the appearance of the landscape is entirely changed by the thinning of the woods and the formation of extensive ponds by the dams, for generation after generation works on, increasing the size of the settlement until the beaver cities in the lonely wood can compete for age with the cities of men. In our thickly populated Germany we look in vain for large colonies of beavers, for they are entirely extinct in most parts of the empire, and where individuals are found they do not build lodges, but content themselves with underground dwellings like those of the otter; only a few districts can now boast of possessing beaver lodges, but a few years ago a colony of thirty individuals was discovered not far from Schonebeck, on the Elbe. Strict game laws have procured a home for him here, and here opportunity is still offered to observe him living under natural conditions. For ages there were colonies of beavers on certain parts of the Elbe and on the Danube, but in the course of time he has become a stranger in his own land.—*Illustrirte Zeitung.*



THE BEAVER.

THERE are 1,785 separate railroad companies in the United States.

Costs of Manufacturing.

The movement which is being made in Congress to reduce the tariff on cotton and woolen goods is of great interest to the people who have their money invested in those industries. They have made great efforts to have their rights protected to such an extent that they can manufacture goods for home consumption and successfully compete with the foreign manufacturer who is so eager to obtain admittance to our markets. It is probably an established fact that, whatever tariff bill is passed by Congress, the duties on cotton and woolen goods that are imported will be lower than under the McKinley bill. With these facts staring us in the face, there seems to be but one course for American manufacturers to pursue, and that is to reduce the cost of manufacturing their goods. Can this be done to any extent, or to such an extent that, should the tariff bill now under discussion become a law, our mills can be operated at a profit? This is a serious question and one deserving much thought.

A close observation in several of our leading mills, both cotton and woolen, within the last three weeks, shows us that few, if any, of them have reached the point where a reduction in the cost of their goods cannot be made. If this is a fact, the question then comes, How can this be done? Let us refer to a few ways in which, in our opinion, quite a reduction in the cost of labor in our mills can be made; first, there are many mills which are using very poor machinery—machinery that has been in use from twenty to thirty-five years. It is of light build, can only be operated at a slow speed, and is of the kind that requires more hands to look after it, even to obtain a small product, than the improved machinery of the present time would require to obtain an increase of 25 or 30 per cent, occupying the same floor space in the mill, and not taking much, if any, more power to operate it. In fact, many of our mills are full of machinery that should long ago have been consigned to the scrap heap and new put in its place.

Another fact is, many, in fact most, of our mills have more help than is required to take care of their machinery. Employes should have work enough put upon them to keep them busy. Not working all the time on the keen jump, but enough so that by keeping busy they can easily perform their task. To bring this change about requires good management on the part of overseers. They should be ever present in their rooms, unless having special business in some other portion of the mill or yard. This being the case, they should attend to that duty as soon as possible and return to their rooms. Their continual presence among their help, even if there is nothing for them to do, is worth a great deal—a fact that every agent and superintendent should impress upon their minds and insist on its being enforced. Our mills are workshops. The employes are there for a business purpose. Every one of them is supposed to and should have sufficient work put upon them to require their full attention and best efforts to perform it during working hours. Overseers should watch carefully and ever be on the alert to check all visiting of their help from one room to another, which is done to such a large extent in mills at the present time. When the overseer is in his room, or department which may contain one or more rooms, he should not spend his entire time perched on a high stool at his desk, but should be circulating about, watching his machines, seeing that no bad work is being made, and if the machinery is in good order to perform its work; not trusting too much to his second hands, but looking himself, to quite an extent, after his section men, ever studying the interests of the company or individual that employs him, and ascertaining if there is not some place where he can better his work, and at the same time reduce the cost of manufacturing in his department. Overseers, as a rule, are a well-paid class of men, and they should look after their departments as closely as if they were in business for themselves and every dollar of capital invested was their own.

Another point we would mention, and this we have carefully studied and know we are right in the assertion, that the waste in our mills is not looked after to the extent that it should be. A tour among the cotton and woolen mills in the old country plainly shows us that in the working of the waste made in our mills we are greatly behind the English. It is surprising to see the marked difference between American and European manufacturers in that one thing alone. We do not place value enough upon the waste made in our mills. Visit any manufacturing point, and you will find waste dealers carting away from our mills enormous quantities of waste for which they pay a very small price. This waste is worth to the very manufacturer who is selling it, if properly utilized, nearly double what the waste dealer pays for it.

Another point we would mention, and a very important one it is, too, and that is the excessive cost of power in most of our mills where steam is used. This comes from two sources: First, the boilers, grates, and steam appliances are such that from one-third to one-half more coal is burned than should be to produce the power that is used. In many cases firemen are not carefully enough instructed about keeping their fires; a great deal of coal is wasted needlessly through the carelessness and ignorance of the firemen, even when the steam appliances are in fair condition. The second thing is the enormous amount of friction in the main lines of shafting in many mills. The shafting is not kept leveled up as it should be; therefore, instead of there being perhaps 15 or 20 per cent of power used to overcome this, 30 and 35 per cent is used in many cases, and when you waste it you waste money.

It is a fact, although we dislike to admit it, our cotton and woolen mills, as regards machinery and the improved methods of manufacturing at a low cost, in discipline, etc., are very much behind those in England. We will allow that many machines are in use there that we do not hear of, and perhaps for the class of goods we are now making we do not need them, but on a common run of work we are very much behind the English manufacturers. The discipline of our mills does not begin to equal theirs. This is a needless neglect, and can easily be remedied. Many of the places where we are weak in our mills can be strengthened at little or no cost. A close observation also shows that many of our mills have more overseers than is really needed. A doubling up can be done at profit in many cases by paying the second hands a little more, and securing better ones. The points we have mentioned are only written after having carefully studied this matter through personal observation, both in this country and in England, and our manufacturers will find we are right in every assertion, if they will take pains to investigate them fairly. It is our opinion that we can produce cotton and woolen goods in this country at a much less cost than is being done at the present time, and we believe our manufacturers will support us in this statement.—*Boston Journal of Commerce.*

The Columbian Exposition Medal.

For the reverse side of the medal, a design of Charles E. Barber, of the Philadelphia Mint, has been accepted, that of St. Gaudens for the obverse being retained. The original design for the reverse was rejected because of its nude figures, in place of which the accepted design contains a shield with the following inscription: "World's Columbian Exposition. In Commemoration of the Four Hundredth Anniversary of the Landing of Columbus, MDCCCXCII, MDCCCXCIII," and a place for the name of the recipient of the medal. The shield is surmounted by the globe, at either side of which are female figures representing Fame. It is said that it will require three months to finish the engraving, on account of this delay in obtaining designs acceptable to the authorities.

Natural History Notes.

The Stability of Characters in Mushrooms.—Cultivators have long known that there exists a large number of varieties of the common mushroom, and that their characters are so clearly defined that certain experts claim to be able to recognize their mushrooms in the midst of the hundreds of baskets that daily reach the market. In fact, they distinguish such varieties by the color, by the presence or absence of scales, by certain circular blotches of the color of wine lees, by the reddish color to the touch, etc.; but what is the botanical value of these varieties? Within what limits are they permanent? That is something that no one can at present say. No gardener can, in fact, cultivate a given variety indefinitely, since, at the end of three successive cultures, on an average, the vitality of the spawn diminishes, and it would be to expose himself to serious losses to desire to preserve a given mushroom too long. Experts well know, on the contrary, that during the successive cultures made with a certain spawn the mushroom gathered always preserves a large number of constant characters, since, in their cultural processes, they merely divide the spawn. The ordinary experience of cultivators, therefore, in nowise proves the fixedness of the varieties of the ordinary mushroom, but merely establishes the point that if the spawn perpetuates itself, it is always the same crop that is gathered. But is the stability of the characters that define a variety as great when, instead of dividing the spawn, we reproduce the fungus by spores? Such is the problem that Messrs. Constantin and Matruchot have endeavored to elucidate.

The results of the experiments that they have undertaken to this effect have shown that the characters of varieties are kept up with remarkable fixedness. The cultivators who furnished the specimens submitted to these experiments did not hesitate to recognize their products as identical with those that had served as a starting point. Hence it follows that the color of the pileus, its scaly or fibrillose aspect, and the presence of a more or less persistent veil are hereditary characters of a stability that has hitherto been unsuspected. Along with these constant characters, there are others that are variable, for example, the size and consistency of the fungus and the relative dimensions of the stipe and pileus. But it should be known that such variations are likewise observed in culture through division of the spawn.

In short, there results from these experiments the important fact that in the future it will be possible to apply the process of selection to the cultivated varieties, and particularly to bring the selection to bear upon the varieties with a white pileus, which cultivators usually prefer. There is even reason to believe that such successive selections will gradually render the products obtained more perfect, just as has been the case with a large number of cultivated phanerogams.

A Great Botanical Work.—The first part of the "Index Kewensis" is now in the hands of botanists. Since the publication of the second edition of Stendel's "Nomenclator Botanicus," in 1840-1, there has been no other attempt to collect and publish the names of the thousands of plants described in the botanical literature of all nations. The "Index Kewensis" is what its title implies, as it gives references to the place of publication of each genus and each species. The foundation of this work, upon which Mr. B. Daydon Jackson and several assistants have been engaged ever since January, 1882, may be claimed for the late Sir William Hooker, who, in a brief preface, gives the following history of the publication:

"Shortly before his death, Mr. Darwin informed me of his intention to devote a considerable sum in aid or furtherance of some work of utility to biological science; and to provide for its completion, should this not be accomplished during his lifetime. He further informed me that the difficulties he had experienced in accurately designating the many plants which he had studied, and ascertaining their native countries, had suggested to him the compilation of an index to the names and authorities of all known flowering plants and their countries, as a work of supreme importance to students of systematic and geographical botany, and to horticulturists, and as a fitting object of the fulfillment of his intentions.

"I have only to add that, at his request, I undertook to direct and supervise such a work; and that it is being carried out at the herbarium of the Royal Gardens, Kew, with the aid of the staff of that establishment."

Sir Joseph Hooker himself has devoted an immense amount of time to the herculean and monotonous task of revision, and has brought his vast personal knowledge to bear on the independent but by no means inconsiderable task of settling the geographical distribution. Mr. Daydon Jackson estimates that the complete work will contain about 400,000 names and many more references; and the first part contains nearly 110,000 names. The period covered is from the establishment of binominal nomenclature by Linnæus down to the end of 1885. If nothing occurs to hinder the present rate of progress, the whole work will be issued by the middle of 1895.

The Insects of Primary Times.—Insects existed as long ago as the Silurian epoch. In the Carboniferous period they were numerous in species belonging to at least four orders, the Neuroptera, Orthoptera, Homoptera, and Thysanoura. Many of them were of extremely large size, and some exceeded in dimensions the largest animals of this group that live in the present time. Some, in fact, had a spread of wings of nearly 28 inches!

Although, in its general feature, their organization was the same as that of the insects that exist around us, it exhibits characters of a great importance in certain types, for these shed considerable light upon certain obscure points of the morphology of these animals and mark the successive stages that the insect type has passed through before reaching its final form. In the first place, the thorax is divided into three segments, instead of forming a single mass, as is generally seen. The first thoracic segment of the present insects carries the first pair of legs, but is always deprived of wings. These organs of flight are inserted upon the meso and metathorax. Some of the insects of the Carboniferous age exhibit this arrangement, but there are others in which the number of wings corresponds to that of the legs, and in which a pair of wings occupies the first thoracic segment. These arthropods are, therefore, hexapterous as they are hexapodous. These first wings, which are smaller than the others, resemble the rudimentary elytra of the mesothorax of the phasmids. It is probable that when we shall come to know the insects that have preceded those of the coal period we shall find that the dimensions of the prothoracic wings were almost equal to those which come after, or else that the three pairs of wings were small and equal to each other. These alar appendages of the prothorax have disappeared in the insects of our time. Besides, several of these ancient insects have preserved in the adult state characters that are found in our day only in the nymphs or in the larvæ.

If we examine the fossil insects from the view-point of the relations that they offer with the present fauna, we see that they differ *in toto* from the living types, not only specifically and generically, but even to such a point that they cannot enter the families created for the types that exist at present. It has, therefore, been necessary to form new groups to take a place in the natural orders. The Neuroptera are largely represented, and offer a great variety of forms. The order of Orthoptera is represented by cockroaches, phasmids, locusts, and crickets; that is to say by about the same groups that still live. Yet we observe quite notable secondary differences between these ancient insects and their present representatives, and which reside mainly in the arrangement of the wings.

Another character of the highest interest is met with in the Blattariæ (cockroach family). The species of our epoch lay their eggs inclosed in ovigerous capsules, others are oviparous. The Palæblattidæ, on the contrary, were provided with an ovipositor and laid their eggs one by one, as do our Phasmidæ and Locustariæ. The present Phasmidæ have the wings of the first pair reduced to the state of scales; the coal Protophasmidæ had the four wings well developed.

The Homoptera were represented in primary times by types whose wing nervation recalls that of the Fulgoridæ, but while the latter have very short antennæ, these organs in the Protofulgoridæ were highly developed.

Finally, some species possessed elongated buccal pieces, and this permits us to believe that these insects sucked the juices of vegetables with these instruments.

A study of the primary fossil insects corroborates the data furnished by plants relative to the climatology of the Carboniferous epoch, and proves that the atmosphere was then humid and warm, and that the light was undoubtedly intense.

The Guests of the Florida Gopher.—The Florida gopher (*Gopherus polyphemus*) is a tortoise that attains a length of 10 or 12 inches and weighs 8 or 10 pounds. It excavates galleries 18 or 20 feet in length in sandy ridges remote from water, which descend in a straight course at an angle of 35°, terminating abruptly at a depth of 8 or 9 feet beneath the surface. It is a reptile of ancient lineage, whose burrowing habits were probably established in ages zoologically remote. Like its European relative, it is a long-lived animal, and its habitation, once completed, is maintained and occupied for a long series of years. Such an ancient and well established domicile, with entrance always open, naturally serves as a place of refuge for many animals when hard pressed by enemies or to night prowlers when daylight overtakes them far from their proper homes. Even the rattlesnake is said to have more than a passing acquaintance with those cool retreats. Among the permanent guests of this reptile is what is popularly called the gopher toad, an animal which is really a frog, and of the habits of which nothing is known. Mr. Henry G. Hubbard, wishing to know something more of the gopher and its associates, was led to undertake the laborous task of excavating and thoroughly examining one of the burrows. The result of his examination was the discovery of thirteen species of insects, ten of them new to science and one representing a new genus. A few of them were characterized by the lack of color and the distinctly subterranean appearance that mark a true cave insect and dweller in darkness. The differentiation of the various forms from their allies above ground had not proceeded so far as to produce profound modifications of structure, yet the variation that had been caused by this half cave life was quite pronounced. It was shown in many of the species, not only by a loss of color, but by a more glabrous surface of the body and a greater slenderness of form than is found in related species. The new species found by Mr. Hubbard are described (some of them with figures) in the May number of *Insect Life*.

That a gallery in the sand of so diminutive proportions as a gopher's burrow can harbor so large a number of hitherto undiscovered insects, and afford an environment potent to effect such changes in the structure and life of animals, might well seem incredible were it not for the very unique conditions which here exist. The temperature of the burrows varies but five degrees throughout the year, the extreme in winter being 74° F. and in summer 79° F.

An Electrical Dinner.

The City of London Electric Lighting Company, Limited, gave lately a large banquet at the Cannon Street Hotel, for the purpose of demonstrating the feasibility and convenience of cooking by electricity. *Engineering* says: Before the dinner commenced the guests were invited to see the apparatus at work, and had the opportunity of inspecting the joints, poultry, fish, vegetables, etc., frying and simmering in the electric ovens and saucepans. A temporary kitchen had been set up close to the dining room; this was, of course, perfectly easy to do, as there were no flues to provide for the escape of the products of combustion of coal and gas. The influence of the near proximity of the cooking apparatus was felt in the hot state of the viands. Instead of having to travel a long distance from a kitchen, either underground or on the highest story of the building, arriving half cold, as is too often the case at public dinners, they were brought direct from an adjoining apartment, and were served before they had commenced to cool. The cooking was in every way excellent, and left nothing to be desired; as, indeed, it should be when the heat is under absolute control, and there are no products of combustion to mingle with the delicate flavor of the comestibles. At the close of the dinner the lord mayor—an authority every one will respect—declared that it had been in every way satisfactory. The chairman, Sir David Salomons, explained that there were 120 guests, and 60 units of electricity, costing exactly £1, had been used in cooking the dinner. This works out to 2*d*. per head, or 0·2*d*. per course, a truly insignificant amount. While the company charge 8*d*. per unit for current used for lighting, they charge only 4*d*. for that employed for cooking and motive power. Dr. Silvanus Thompson, in reply to the toast of "Success to the Development of Electricity," recalled a former electric dinner given in 1749 by Benjamin Franklin on the banks of the Schuylkill. The turkey was killed by an electric shock, and cooked by a fire kindled by an electric spark, while various electric experiments seem to have served as entrees in an intellectual entertainment which preceded the dinner. Dr. Thompson's wonderful knowledge of early scientific history renders his speeches, on such occasions as these, most interesting.

Watering Garden Plants.

Watering garden plants, as commonly practiced, is an absolute injury to vegetation, for the reason that it is not done plentifully enough. When the earth is dry and hot, the application of a little water only increases the heat and has a tendency to make the soil more compressed and drier than before. The most of our soils are more or less calcareous, and the action of the sun's heat has the same effect as heat upon limestone. The carbonic acid is expelled, and when brought in contact with moisture heat is generated, and unless sufficient water is applied to overcome the heat, vegetation suffers. A sprinkling pot should never be used in time of drought, unless the soil around the roots of the plants is at the same time thoroughly soaked, and the watering should always take place after sunset, when the dew has begun to fall.

This is in accordance with natural laws. Rain and sunshine seldom appear together, and, further, when nature waters vegetation the atmosphere is filled with moisture. Pool water and soapsuds are good for the garden, and cistern water may be used, but should be exposed to the sun and air through the day before applying. Strong liquid from the barnyard is death to garden plants and should only be used after diluting until very weak. My plan of watering to avoid making a hard surface crust around the plants, says a writer, is to dig three or four holes on the different sides of the hill a few inches away, and into these pour not less than one pailful of water, and after all has soaked in replace the dry earth, and then with watering pot sprinkle the dry earth.—*Farmers' Voice.*