STUDENTS' ENGLISH SERIES

No. XII

POPULAR SCIENCE READER

BY

JAMES MONTEITH

(ADAPTED AND ABRIDGED)

TŌKYŌ

Dai-Nippon-Tosho-Kaisha

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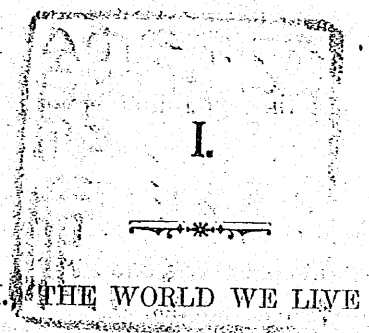

I.

I. THE WORLD WE LIVE IN.

If you should take a long walk from the city, town, or village in which you live, you might see people, houses, streets, roads, fields, trees, streams, ponds, mills, factories, besides horses, cows, sheep, and other animals; perhaps you would see a part of the ocean, on which great ships and steamers sail.

2. The **ocean** and **fields** are parts of the earth's **surface.** People, animals, trees, houses, ships, etc., are *on* the surface. When you see flies on an orange, you may say they are on its surface or outside part, just as people and animals are on the **surface** of the earth, which is round like an orange.

3. When you look upwards and around you, you may see the sky, the sun, and, perhaps,

clouds; at night, you may see the moon and stars, and other bodies called planets, which look like stars.

4. All this time you are breathing—what? *Air*. Without air you could not live, nor could any animal, bird, or fish, or tree live. Sometimes the air is still, sometimes it moves gently, and you are able to fly your kite; then, again, it rushes powerfully and fearfully, blowing down trees, fences, and houses, and sinking ships.

5. This we call wind. You feel the air, you breathe it, you see the effects of the wind, yet you have never seen air or wind. You admit that there is air and that there is wind, although both are invisible. What does invisible mean? Are houses and trees visible or invisible?

6. Now, as the earth is round (or very nearly so) like a great ball, and people travel or sail around on every part of it, what is it that keeps them from falling off from this great ball called the earth or the globe? It is something that is both useful and powerful. It is also invisible.

7. When you throw your ball high in the air, it is brought back again by something

which you cannot see, by this other invisible power; without this power your ball would never come back to you.

8. When chestnuts are ripe, and when you throw a stone into an apple-tree in the autumn, the chestnuts and apples are brought to the ground by this same invisible power. Do you know what we call it? *Attraction.*

9. Without this attraction which the earth has, those chestnuts and apples would be as likely to fly away toward the moon or the sun or some of the stars; the farmer could not sow his seed, for it would be as likely to fly toward the clouds as to fall on the ground; the carpenter and the mason would not be able to keep their boards and bricks just where they wanted them; the chairs, tables, and beds in your houses would be as likely to rest against the ceiling as on the floor; and your sleds would no longer rush down hill on the smooth snow in winter.

10. Now, a knowledge of all such things, as well as of different countries, mountains, and places on the earth, and of the wonderful fitness of them for people's enjoyment and welfare, may

be obtained by studying geography.

11. When we look at the sun, moon, and stars, we see they are round; and if there are people living on the moon now, they would look at this world or earth and see that it too is round.

12. The earth is larger than the moon, the sun is larger than the earth, and some of the stars are larger than the sun.

13. The earth moves around the sun, and the moon moves around the earth.

14. If the earth did not move or revolve around the sun, we should have no change of seasons.

15. The earth has another motion: it turns around as a top spins, or as you might turn an apple around on a knitting-needle. This kind of turning is called rotation, and causes change from day to night, and from night to day.

16. When you say the sun rises in the east in the morning, it only appears to rise. It is not the sun which moves from the east upward and nearly over your head, and then down in the west in the evening. It only *appears* to do so. It is really the earth, or that part of it on

which we live, that moves around the other way, toward the sun in the morning, and away from it in the afternoon; that is, from the west over to the east. When you are on a steamboat sailing swiftly and smoothly, the trees on the shore appear to move toward you, then past and behind you, yet you know it is the steamboat that moves—not the trees.

17. Without the sun we should have no heat or light. Would we not have wood to burn and give us light? We would not; for without the sun's heat trees would not grow. Would we not have the moon to shine for us? No, the moon would not give us light, for it is the sun's light on the moon that makes it bright and gives us moonlight nights. So, without the sun, there would be no light on the earth—no plants, trees, animals, birds, fishes, or people.

18. You have learned how important are the sun, air, and attraction. You will soon learn about rain, how it depends upon the sun, air, and winds, and how they all work together beautifully and continually in order that all people may have food to eat, water to drink, and pleasant places to live in.

19. Suppose you should start some pleasant morning in a *balloon* that could move all the way around the world before dark the same day. Of course, that has never been done, for the distance is too great, but suppose it could be done. What would you see? Well, you would glide over an immense portion of land, called a continent. On this continent you would see **mountains, hills, valleys, rivers, lakes, farms,** and **trees.**

20. You might see men at work in the fields, others building houses, or bridges, or railroads; some busy in great factories and mills making cloth, shoes, flour, tools, wagons, and other things too numerous to mention. Here and there you would see cities, towns, and villages, and, beyond them, farm-houses, barns, etc., at intervals; then, perhaps, a forest, a wilderness or wild place, inhabited only by Indians and wild animals; then, again, beautiful valleys, plains, streams, and busy towns; and all at once you might come to a body of water which extends much further than your eye could reach. That great body of water is an **ocean.**

21. In the ocean, dotted here and there,

you might see islands, which also contain trees, hills, lakes, people, birds, animals, etc., all different in appearance from any you had seen before; and you would wonder to find that, as you rush so rapidly over land and sea, some places have clear weather; others, cloudy; and still others rainy or stormy, all in the same day.

22. After your return home, which you would be sure to reach if your balloon kept in the precise course it started out on, you would, probably, sit down and write about all the places, people, etc., you saw: and, for the instruction and pleasure of those boys and girls who were unable to take such a voyage, you would, perhaps, fill a book with your description: that would be geography, which is simply a description of the earth's surface.

II. THE OCEAN.

The Ocean, often called the sea, covers three-fourths of the earth's surface. Its water is salt and in constant motion. In it live countless

fishes, and on its surface very many **ships** sail from one country to another, carrying people, provisions, clothing and various articles for use or ornament.

2. The ocean is useful to us not only in furnishing fish, and as a great highway for sailing ships and steamers. There are many boys and girls who have never seen the ocean, or eaten any of its fish, or seen anything that was brought in a ship. Lest they should think, therefore, that the ocean is of no use to them, and that it would have been better if the whole surface of the earth were laid out in pretty fields, farms, and gardens, they should know that without the ocean no man, bird, or animal could live on the earth.

3. Animals live mostly upon grass, vegetables, or grain of some kind, which grow on the farms and in the fields.

4. The **rain** waters the fields and farms, fills streams, rivers, and lakes, and furnishes drink for men and cattle and all creatures that live on the earth. When the vapor or moisture in the air freezes, it falls in the form of snow. When the drops of rain freeze before they reach

the ground, they fall in the form of hail.

5. From this you may readily understand how a certain drop of water may be changed to vapor, rise from the ocean, be carried by the winds far away and over the land, changed back to water, fall on the ground, sink down below the surface, find its way to a spring, reappear in the overflow, run down a hillside, and become part of a **rill, rivulet, brook,** or other little stream. The stream flows on, falls over steep places forming **cascades** or **waterfalls,** turns **mill-wheels,** receives other **streams,** becomes deep enough and wide enough to float large **steamboats,** and at last finds its way into the ocean. Thus that little drop of water after a long and curious journey, may return to the place it started from.

6. As the land on the earth's surface is higher than the ocean, you all know that the water of the ocean could not run *up and over* the land.

7. All of you who have seen a kettle or pot of water boiling have noticed that something white, like smoke, rose from the top of the water. It was not smoke, but vapor. **Vapor**

is the water so thinned out by heat as to become light enough to rise in the air. Have you not also seen the inside of windows in cold weather all wet with drops? The vapor coming near the cold window is only changed back again to water.

8. If any of you should hold a cold substance, such as a pitcher filled with snow, or ice, or cold water, over boiling water, you would see the vapor rise, and as soon as it touched the cold surface of the pitcher it would be changed into drops. That is the way rain is formed.

9. Now if you should watch the vapor as it rises from the ocean, and is carried by the wind over the land, you might see it enter the air that is cooled by cold mountains. As cool air cannot hold as much vapor or moisture as warm, dry air, some of the moisture falls in the form of rain. That which falls on the land waters the fields and farms, and fills the streams and lakes.

10. The ocean then, supplies or fills all the lakes, ponds, rivers, and streams; every drop of water on the surface or under the surface of the land, on the mountain top or in the deepest

valleys; all the water of the wells and springs; all the moisture which floats in the air; and all rain, snow, hail, or dew.

11. If you should boil a kettle of salt water, the vapor passing off would be fresh. This you may prove by conducting the vapor through a tube or pipe cold enough to condense or change the vapor back again to water; this water will be fresh.

12. The changing of water into vapor is called evapora'tion. The changing of vapor into water is called condensa'tion.

13. The words ocean and sea are often used to refer to the whole body of salt water on the earth, which may be considered as divided into five parts, also called oceans. There are five oceans. Their names are **Pacific Ocean, Atlantic Ocean, Indian Ocean, Arctic Ocean, Antarctic Ocean.**

14. If you should cross the ocean, you would see nothing about your ship but the water and the sky; and, as the vessel would cut through the great rolling waves, it would go up and down like a rocking-chair. In a storm, however, the waves rise terribly high and beat over the ship,

which tumbles and plunges and rolls vi'olently, sometimes nearly covered over with the waves. Then the passengers must go down stairs or they would be washed overboard. Besides this there is danger of one ship running into another at night or against an iceberg, or of the ship taking fire.

15. To capture whales men spend many months on long, cold voyages, and we frequently hear of ships being crushed by icebergs or by fields of ice, and the crews frozen or starved to death. All this is for what purpose? *To get oil and whalebone from the whale.* When the whalemen see a whale they hurry out of their ship and row in open boats towards him, and when near enough, one of the men throws a kind of dart or spear, called a harpoon, with all his might into the whale. The huge creature becomes furious, and the men must look sharp to keep out of his way and to let out the long rope which is fastened to the harpoon, else their boat may be dashed to pieces or pulled far under the water in an instant.

16. Many whales are killed by means of harpoons and bombs fired from cannons which the ships carry with them. When a ship arrives

in the vicinity of a whaling ground, a lookout is stationed at the masthead. As soon as a whale is discovered, the boats are lowered and each crew exerts its utmost strength to reach him first. In the bow sits the harpooner, who at the proper moment, seizes the harpoon with one hand and the coil of rope with the other; and as he nears or touches the whale, hurls his harpoon with all his strength and cries out "Stern all." The crew instantly backs the boat, and the whale in his terror plunges and dives with such velocity, that water must be constantly poured upon the rope to keep it from setting the boat on fire by its friction. Every time the whale rises, which he must do at least once or twice every hour in order to breathe, the boats rush at him and the men strike him again and again with harpoons and lances.

17. After a while the whale dies and floats at the top of the water. Then the men jump on him and cut out great quantities of the fat which is found right under the surface of the skin. They afterwards boil the fat, called blubber, and make it into oil, which they take home in barrels.

18. The whalebone, which is obtained from the inside of the upper jaw, is colored and prepared for use. The whale is always in the water, and is the largest of all animals.

19. There is a very large animal called the wal'rus which lives in the Arctic regions and is always found on the coast very near the water. Walruses are excellent swimmers, but are very slow and awkward in their movements on shore. When disturbed they make loud roarings. Their length is about fifteen feet. They are captured for their tusks of ivory, their skin and fat. They often have terrific com'bats with white or polar bears. When suspecting an attack, they designate one or more of their number to act as guards while the others sleep. They defend themselves bravely, carrying off their helpless young or their wounded companions with their fore paws.

20. There are other animals called seals living in or near the water, which are captured in very large numbers every year in the cold regions.

21. The seal is about two yards long. It has two fore paws, with which it paddles in the water or pulls itself along on the ice or the

shore. Its hinder limbs serve only to steer and scull with. Its head resembles that of a dog.

22. In **Greenland,** where the cold is too severe for trees, plants, and fruits to grow as they do in our country, many of the people depend upon the seal for almost everything: its flesh they use for food, of its skin they make their clothing, tents, and boats, and its fat furnishes them with oil for fuel and light.

23. The seal is found on coasts and islands in many parts of the world, but especially in the cold regions. Around **Alaska, Greenland,** and **New'foundland** thousands are captured every year.

24. The different species of the seal include the sea-lion, sea-elephant, sea-leopard, sea-bear, and the walrus.

25. The porpoise is very much like the seal. It is captured for its oil, flesh, and skin.

26. Cod, mack'er-el, herring, and hal'ibut are caught in immense numbers near the coasts of New England, Labrador, and Newfoundland. When salted and cured they are exported to nearly every part of the world.

27. On the shoals or shallow place are the banks of New'foundland, where, during several months

in the year, you may see hundreds of boats and thousands of men of different nations, engaged in fishing.

28. A codfish of the ordinary size is about two feet in length. The mackerel is about 15 inches in length. It is caught by hook and line, and by a seine or net. It is salted in barrels. The halibut is a larger fish, measuring from 3 to 6 feet in length. Curiously, both its eyes are on the same side of its head.

29. Did you ever see flying fish? They are found in the **Mediterranean Sea,** the **Gulf of Mexico,** and warm parts of the ocean. Their long fins enable them to fly out of the water as high as the decks of ships, on which they sometimes fall. Their length is about ten inches.

30. Another singular fish is the sword-fish, 12 to 20 feet in length. It is so fierce, and so swift in motion, that it drives its sword, a long, sharp, bony substance, into a fish which it wishes to capture. It has been known to attack a ship and bury its weapon deep in the timbers.

31. Here is still another very curious fish. It is a cuttle-fish, which has eight long arms for seizing other creatures which it captures for food.

When pursued, it discolors the water all about it with an inky substance, which enables it to conceal itself and escape from its enemy.

32. Among the fish which men and boys delight to catch, are the pike and trout. The pike, which is about 2 feet long and 3 inches wide, is caught in streams and lakes, and is delicious for the table. The trout averages about 16 inches in length. It is caught by hook and line in the streams of the New England, Middle, and Western States, and Canada. It is usually found in swiftly-running streams, swimming against the current.

33. A very fine fish which comes from the south in the spring, entering the rivers and inlets of the States along the Atlantic Coast, is the shad.

34. You may have seen enclosed in tin boxes and packed in olive oil a great many very small fishes. Do you know their name? *Sardines.* They are caught in large quantities in the Atlantic Ocean and the Mediterranean Sea.

35. Among the most highly prized of all the fishes, as an article of food, is the salmon. Its flesh is eaten fresh, salted, dried, and pickled.

It is found in the northern waters of North America, Europe, and Asia, from which it enters the rivers, ascending during a flood, at the rate of 25 miles a day. It is remarkable for its strength and perseverance in surmounting cascades; in doing this, it has been known to spring 14 feet out of the water and to describe a curve of over 20 feet in length.

36. Many streams of **Can'ada** abound with salmon, and the fisheries on the Columbia River, north of **Oregon,** are the most profitable in the world.

37. The length of a salmon is about three feet, but sometimes one is caught weighing 60 or 70 pounds, which is very much larger.

38. There is a kind of fish found or caught in salt water called shell-fish, as oysters, clams, crabs, and lobsters. These are found near the shore in great quantities. Oysters are usually found adhering to rocks or in the sand in salt water. Do any of you know what kind of a jewel, worn extensively by ladies, is found in some oysters? *The pearl.*

39. Pearls are obtained by divers. Divers do not always go down head first. Sometimes

one is lowered by a rope, on the end of which a stone is fastened to help him to sink. With his feet upon this stone and one hand holding on to the rope, the diver collects as many of the pearl-oysters as he can in a minute or half-minute, when he must ascend to breathe.

40. There are pretty ornaments made from the skeletons or kind of bony substance of small creatures which have died in the ocean in such large numbers as gradually to form islands. What is that substance? *Cor'al.* This is also obtained by divers. The finest is of a rose-pink color, and is found chiefly near **Italy.**

41. Sponge is also the skeletons of what were once living creatures. It is very soft, and it adheres to rocks, shells, etc., under water. It looks like a sea plant.

III. COD-FISHING.

Accustomed from childhood to brave the hardships of a most rig'orous climate, in navigating their frail schooners amid tempest, ice and

fog, the inhabitants of New'foundland have developed into one of the finest seafaring populations on the face of the globe. Nowhere can better mariners be found.

2. The principal industry of Newfoundland is the cod-fishery, and the chief center of the trade is at St. John's, its capital where the process of packing and shipping the salted fish may be witnessed to perfection. The fish, having been dried on stages or platforms erected for the purpose on the shores of every bay and inlet of the island, are brought to St. John's in small schooners and thrown in heaps upon the wharves. There they are culled and sorted into piles according to their quality.

3. Women with hand-barrows attend upon the cullers, carry the fish into an adjoining shed, and upset their loads beside barrels standing ready to receive them. A couple of boys throw the fish into a cask, piling them up a foot or so above the brim, mount on the top, and having danced a war-dance upon them in their hob-nailed boots to pack them down, roll the barrel under a screw-press, where men stand ready to take charge of it.

4. The cask is then rolled out from under the press, and handed over to two coopers. In a trice the hoops are driven on, the cask is headed up, and then trundled down an incline into the hold of some vessel, loading for the West Indies or some Mediterranean port.

IV. CATCHING SEALS.

Sealing operations are vig'orously conducted by the inhabitants of St. John's. In former days the seal fishery was carried on in sailing vessels, and was attended with considerable danger; but now that steamships are used the risk is much diminished. The paying nature of the business may be gathered from the fact that steamers make a large profit, although the sealing season lasts only a month or six weeks.

2. Early in the spring, the ice from the north strikes in towards the eastern coast of Newfoundland, bringing with it hundreds and hundreds of thousands of seals, young and old. Then St. John's wakes up, and the whole island

is in a bustle. Though it entails constant exposure to great cold, and extremely hard work, the young men struggle eagerly to secure a berth for the sealing season, for they earn very high wages, enjoy the sport, and the business involves uncertainty and danger which add such a rel'ish to their lives.

3. At length everything is ready, and a fleet of steamers and of sailing craft of all kinds and sizes, from large coasting schooners down to open boats, issuing from every bay, start out to look for the ice. The ships, crowded with as many men as they can hold, make two trips of about a fortnight's duration each; the first being devoted to the capture of the young seals, at that time only a few weeks old, and the second to the destruction of the full-grown animals. The latter are generally shot, while the former are knocked on the head with clubs.

4. As soon as the ice is reached, the men scatter themselves about the field, running over the rough surface, jumping from block to block of loose ice, tumbling into holes and scrambling out again, wild with excitement in their search for seals.

5. Each man acts independently, doing the best he can for himself. When he has killed a seal he stops but a minute to whip off the skin with the blubber attached, and fasten a cord to it, and then he starts off again after another seal, and so on till he has secured as many as he can drag: then he returns, towing his load behind him, to the ship.

6. These seals are valuable only for the oil which is tried out of their fat, and which is employed for various lubricating purposes, and for their skins, which are tanned and used principally for shoe leather. They do not produce the pelt which, when plucked and dyed, is worked up into those lovely sealskin sacques which ladies so much delight to wear in cold weather.

7. The number of seals brought in annually is very great, as many as five hundred thousand having been killed in a single season. The business employs nearly ten thousand men.

8. The ice, on which they come down in swarms every year from the north, melts during the summer months soon after coming in contact with the warm waters of the Gulf Stream.

9. What then becomes of the seals? Do they find their way back through thousands of watery miles to their polar birthplace, or do they remain scattered about along the shores of Newfoundland and the neighboring continent? It is a problem in natural history.

EARL OF DUNRAVEN.

V. LIGHT-HOUSES.

Light-houses are very necessary in saving ships. When the wind is blowing a ship towards the shore on a dark night, if there were no light-houses the ship would inevitably be destroyed.

2. The **United States** has many miles of sea-coast along the **Atlantic** and **Pacific** Oceans, as well as on the **Gulf of Mexico,** and also in the **great lakes** of the north; these lakes are like seas of fresh water.

3. To protect the shipping on all this long line of coast this country supported in 1873 six hundred and twenty light-houses.

4. Light-houses are built of stone, brick, or

iron. To look at some of the rocks before a light-house is built on them, you would say that it was impossible to build anything on such a slippery, wave-washed place as that, for sometimes the rock can be seen for a short time only at low tide.

5. The ingenuity and patient thought of man can, however, overcome many difficulties, and one plan after another has been tried, until all obstacles have been overcome.

6. The next time it blows hard on a dark night, especially if the wind blow towards the shore, you can readily imagine every one on board a ship peering eagerly to see the wished-for light. When at length they see it, what joy spreads from stem to stern! The captain takes out his watch, and, after observing a little, says: "It is a revolving light, and it revolves in so many minutes; now I know which light it is, and I know just where we are."

VI. OCEAN CURRENTS—GULF STREAM.

The waters of the oceans are in constant

motion, those of warm parts of the earth flowing toward the cold regions, and those from the cold parts flowing toward the hot regions.

2. The coldest parts of the earth are the most northern and southern and the hottest parts are midway between them, or on each side of a great circle called the Equator.

3. In the oceans are great streams or currents which flow like rivers. The warm stream is called the Equatorial Current, and the cold streams are called Arctic and Antarctic Currents.

4. One of the principal branches of the Equatorial Current is called the Gulf Stream, which issues from the **Gulf of Mexico.**

5. This Gulf Stream, flowing in a northeast direction across the Atlantic, is, therefore, a stream of warm water rushing through and over the cold waters of that part of the ocean.

6. The Gulf Stream and winds from the southwest carry heat all the way to the west coast of Europe, keeping the fields of **England** and **Ireland** fresh and green even in winter, and protecting those countries from a climate similar to that of **Labrador,** where for five or six months in the year the waters are frozen and the ground

is all covered over with snow. Observe that Labrador is no further from the Equator than are those countries.

7. The waters of the Gulf Stream moderate the winters also of **Norway** and **Iceland.**

8. There are other currents in the ocean; one in the North Pacific is similar to the Gulf Stream of the Atlantic. It carries warmth and fertility to the shores of **California, Oregon,** and **Washington Territory.**

VII. SHIPS, DOCKS, ETC.

On the sea-coast or on the bank of a river you will sometimes find a ship-yard where ships are built.

2. To build a ship, men lay a great, long timber called the keel, on an inclined track or platform. To this keel are fastened the ribs, or curved timbers, which form the sides of the ship. The whole is supported and surrounded by a great frame called the stocks.

3. The ribs are then covered with thick

planks, and those planks which are below the water-line are covered with plates or sheets of copper or other metal.

4. Steamships are now built wholly of iron and steel. The plates, instead of planks, are secured by bolts and rivets passing through their overlapping edges. Iron ships can carry larger cargoes than wooden ships.

5. When the body or hull of the ship is ready to be launched, long, slanting timbers are placed under it, reaching down into the water. These timbers or tracks are covered with grease and soap, some of the props removed, and the whole is made to slide down into the water. People take great pleasure in witnessing a launch.

6. After the ship is launched it receives its masts and sails, and is finished. If intended for a steamship, it is also provided with engines, furnaces, smoke-pipes, and perhaps paddle-wheels.

7. Instead of paddle-wheels, which you may see at the sides of steamboats, you will find that now most steamships are driven by a propeller, or huge iron screw, at its stern, or hinder part. When this propeller turns round and round very rapidly, its great, wide arms strike the

water in such a way as to push the steamer ahead at the rate of about fifteen knots or miles, every hour.

8. The rude savage straddled his log and floated first along the shore. Then came the idea of a mast with a sail of skin or matting. As soon as men learned how to make planks they used them to make boats. These increased in size, as did their sails, until large enough to be called sloops or schooners or ships, which can carry hundreds of men and thousands of tons of merchandise for thousands of miles across a trackless ocean.

9. The immense quantities of cotton, corn, wheat, butter, cheese, petroleum, beef, pork, and other articles which are being shipped to Europe every year bring great wealth to this country.

10. When men discovered the power of steam, they made steamboats and steamships. These move over the water by means of the power of the vapor of water, that we call steam.

11. Men have also made steamers whose outside is entirely of iron. One of these, the *Great Eastern*, is like a small village in the number of persons it can carry.

12. War-steamers of iron have been built with very thick sides so as to resist cannonballs.

13. A dock is a part of a harbor or river which is enclosed between piers, wharves, or high banks, where vessels may enter to load or unload.

14. Some docks have gates to close tightly where it is necessary to prevent the water from running out with the falling tide.

15. A dry-dock is one from which the water may be shut out or pumped out.

16. Some dry-docks are floating docks. Such have cisterns or hollow spaces between their sides or under the floor, into which water is admitted until the dock sinks deep enough to admit a vessel needing repairs.

17. When the vessel is properly braced or propped up, the water is pumped out by steam, and the dock, vessel and all, rise.

18. Some docks at low tide are entirely without water. Such are enclosed by strong gates, like those of canals, which keep the water in to float the vessels. These also are dry-docks, although not floating docks.

19. When a vessel needs repairing or cleaning, it sails in with the rising tide, and is then propped up. When the tide falls the gates are opened, and the water passes out; then the gates are closed, and the water is kept out until the vessel is ready to sail. These stationary dry-docks are constructed only in those rivers and bays in which the rise and fall of the tides are sufficient for the purpose.

VIII. ABOUT THE ZONES.

On the map of the world you may see lines crossing from east to west. These lines or circles divide the earth's surface into five great belts or zones, which differ greatly in the amount of their heat and cold.

2. The hot zone is called the Torrid Zone. When you read of any country which is so warm that the people wear the coolest and lightest clothing, and where trees, flowers, and fruits grow all through the year because no frost ever touches them, where beautiful birds and large, savage animals are numerous, where boys

and girls never enjoy skating or snowballing, and where the sun is sometimes directly over people's heads, you may know that country is in the Torrid Zone.

3. Countries which have such a hot climate are mostly in Africa, Southern Asia, and South America.

4. In some parts of Africa you might travel many days without seeing rain, or grass, or trees, or anything around you but a hot, sandy desert; while in other parts where there is rain with the intense heat, the dense forests, high grass and warm streams afford shelter to countless wild creatures.

5. In the southern parts of Asia are Arabia and India, where the heat is sometimes fearful, and where lions, tigers, and poisonous serpents are feared by everybody living there.

6. Nearer us, and also in the hot zone, is the northern part of South America, where no one ever sees any snow or feels cold weather, unless he climb far up one of those huge mountains whose tops are always covered with snow; that is the land which is famous for innumerable birds, fishes, and monkeys—the basin of the Amazon.

7. The cold zones—there are two of them—are called the Frigid Zones. They are the parts of the earth furthest from the hot or Torrid Zone. One is north of the Arctic Circle, and the other is south of the Antarctic Circle. There men can hardly endure the cold. They wear thick furs throughout the year.

8. Only in the Temperate Zones do people enjoy the four delightful seasons—spring, when the farmer plows and sows, and when the grass and plants spring up; summer, when trees are covered with leaves, and fields with ripening grain; autumn, when the fruits are gathered and the leaves fall at the approach of frost; and winter, when all nature seems asleep under a beautiful white covering of snow. We live in the North Temperate Zone.

9. You have heard that some countries are very warm at the same time that some other countries are very cold. That is true.

10. If two boys should start from this country in the month of March, one for Greenland and the other for South America, one would find it colder and colder, and the other warmer and warmer, every day.

11. If each should write a letter home from there on New Year's day, one might read like this:

"It is dreadfully cold here. All around, as far as I can see, are ice-fields, icebergs, and snow. Even in summer, it is so cold here that we must wear the warm furs of the seal or bear which men kill here."

12. The other boy would write from Brazil something like this:

"This is New Year's Day, the first of January, and it is so hot that I feel just like staying in the shade all the time fanning myself. I go in swimming every day. There are lots of nice oranges and bananas on the trees out of doors, and more beautiful birds and funny monkeys in the woods than I can count.

IX. RIVERS, CASCADES.

You would not ride far on a railroad without crossing one, perhaps several, rivers, which are streams of water always flowing toward lower ground. Some are formed by rain which sinks into the ground and appears again

at openings in lower ground as springs, and others are formed far up the sides of mountains merely by the melting of snow.

2. Rivers at first are usually very small; almost any of you could jump or wade across them. In some places they tumble over precipices, where they are called cascades or waterfalls. But as they flow on and down, they are joined by other little streams coming from different directions, and little by little they grow larger and deeper.

3. In some places you would find boys and men having fine sport with their fishing-rods, lines, and hooks catching trout or other fish.

4. As you descend the stream, you may see a mill so built that the rushing water may turn a great wooden wheel. This wheel is made either with broad arms like the paddle-wheels of a steamboat, or with buckets at its outer edge, that the stream may so strike these arms or fill the buckets as to turn it round and round.

5. As the wheels of all mills are not turned by water in precisely the same way, there are three different ways of applying the water to the wheels.

6. When the water is shot over the wheel it is called an overshot-wheel.

7. When the water comes just abreast of the axle of the wheel it is called a breast-wheel.

8. One which is turned by a stream running under it is called an undershot-wheel.

9. Such a one is used by the washerwomen in **Paris,** where it is attached to the side of a large, stout boat that is held fast by anchors or cables, and does their work for them.

10. This stream that runs down hill is also very useful for carrying down logs. In the winter, when the farmers cannot plough or sow or reap, they go into the woods and cut down trees. The branches they cut off and draw home for firewood, but the trunks they cut up into logs of about thirteen feet or more in length, and then roll them to the bank of the stream, or drag them on the snow by means of oxen or horses.

11. As soon as the snow is melted and the streams are full, so that they have plenty of water to float them, the wood-choppers roll the logs into the stream, and away they go, helter-skelter, until they are stopped by a "boom" or stout log that is fastened there for that purpose. Then, one by one, they are dragged into the saw-mill, which gets all its power (either steam or water-power) from the same water that brought down the logs.

12. When a log is fixed securely in its place, the big saw begins to saw it up into boards. Sometimes what is called a "gang-saw" is set to work, which cuts up a log at once into good boards or planks.

13. Some rivers carry from the lands through which they flow rapidly great quantities of soft earth or mud, called silt, which they deposit at or near their mouths.

14. Noted for this are the **Mississippi, Nile, Ganges, Danube, Po, Rhone,** and **Rhine.**

15. The mud deposited in this way divides the stream at its mouth, giving it several mouths; the land so filled between these mouths is called a delta.

16. The land on which the City of **New Orleans** stands, and for a long distance all around it and down to the Gulf of Mexico, was carried there by the **Mississippi** River and

its branches.

17. After long and heavy rains or the sudden melting of a winter's snow, some rivers become so full that they overflow their banks, and the rush of their water over the low lands causes great destruction to property and loss of life. To prevent this on the lower Mississippi, men have constructed long, high banks, called levees.

18. Sometimes, however, a bank bursts or is washed away, and the overflow does immense damage to crops, houses, cattle, etc.

19. Although damage is often done in this way by inundations, they are not always destructive; indeed, in some places people could not live without them.

20. One of the oldest and most celebrated countries in the world owes its existence to the yearly rise and overflow of a river. That country is **Egypt,** and that river, the **Nile.**

21. Rain is almost unknown in Egypt, and, consequently, without the yearly rise of the Nile, that country would be a desert.

22. The Nile rises so high (30 to 35 feet) that very high banks have been constructed in Egypt.

23. Through gates or openings in these banks and by means of small canals or ditches, the farmers conduct the muddy water of the Nile to their farms and allow it to flow all over their land and cover it with that soft mud which makes the soil very fertile.

24. Some rivers are, for long distances, confined between high, natural banks or bluffs, like the beautiful **Rhine,** which flows through Germany; others flow between very high mountains, and in deep gorges or ravines, called cañons (*kan'yons*).

25. Where the bed of a river is very rough, rocky and sloping, the water rushes down violently and rapidly. Such parts of a river are called rapids.

26. A lake is a body or collection of water which is formed and fed by one or more rivers; these are called its inlets. The water of most lakes is fresh; some lakes which have no outlets or outflowing streams are salt.

27. Lakes and rivers are very useful in many ways; people sail on them to different parts of their State or Country, and on them they send and receive all sorts of things, such

as food, clothing, and building materials, very easily and cheaply. On account of these advantages people have built cities, towns, and villages on or near the banks of rivers and lakes.

X. THE WINDMILL.

The windmill is a machine by means of which we take hold of the wind, that we cannot see, and make it do work that we can see. Windmills are often used in this country to grind wheat into flour, and corn into meal, and to crush sugar cane.

2. The large sails of the windmill turn a large shaft with a cog-wheel—that is, a strong iron wheel with teeth, called cogs, all around it. These teeth, or cogs, fit into the cogs of other wheels and make them go round, so that you can change in any way that is necessary the direction of the moving wheels. Thus a very large, round, and flat stone with a hole in the middle is made to turn around above another

stone and very close to it.

3. If wheat is poured into the hole in the upper millstone it gets down between the stones, and there, as this upper millstone turns around, the wheat is ground into flour, which drops out all around the edges of the stone. Sometimes this is done by steam-mills. This flour is sifted, and put into barrels, and then sold to those who wish to make bread, biscuit, cakes, pies, or anything else from it.

4. In **Holland,** where the land in some places is lower than the surface of the sea, hundreds of windmills are placed along the dikes for the same purpose. They can also be seen in this country near some large country-seats, where they are used to pump up water, so that it may be had in the highest stories of the houses.

5. Near one of the Prussian palaces in Potsdam stands a celebrated windmill. Frederick the Great desired to purchase it, that he might pull it down for the purpose of extending his gardens in that direction; the miller refused, and the king brought a suit against him, but was beaten in the court.

6. He then erected for the miller the pres-

ent large mill, as a monument of Prussian justice. Some years since, the owner, having met with reverses, offered to sell the mill to the king, who immediately settled enough on the miller to defray his debts, saying the mill belonged to Prussian history, and should not be removed.

XI. WELLS, SPRINGS, ETC.

You already know that people obtain fresh water from springs, lakes, and rivers. Where else is fresh water obtained? *From wells.*

2. Water is brought up from a well by means of a bucket, or a chain pump, or a suction pump.

3. A chain pump is composed of an endless chain, which runs through a pipe.

4. A suction pump is one in which the water is made to rise by the weight or pressure of the air.

5. Air is everywhere, until it is displaced

by something else; a cup or a pitcher, when said to be empty, is full of air.

6. Air has weight, and is moved just as water and sand have weight and are moved. Like water, air can be pumped.

7. Air rests or presses on the land and also on the water in the ocean, a cup, or a deep well.

8. If you should remove the air from any spot on the water, you would see the water suddenly rise just at that spot, showing the pressure of the air on the surrounding portions.

9. If you should suck the air from a straw which has one end in a cup of water, you would see the effect of air pressure in the rising of the water in the straw.

10. When a pump is thus placed in a well, and the air removed from it, the water rises, because the air which rests on the water in the well presses it up.

11. In the first drawing, the water in the well and that in the pump are on the same level, because air is pressing down equally on the water both inside and outside of the pump.

12. The pump is provided with two little

trap-doors called valves, which fit tightly. The lower valve is fixed, the other is moved up and down by means of an iron rod attached to the handle.

13. The upper valve removes the air from the pump, and immediately the water is pressed up and flows out at the spout.

14. The valves are so made that the water and air by pressing upwards open them and rise above them, but by pressing downward, close them; therefore, the valves prevent the return of the water through the pump into the well.

15. When the upper valve goes down, it is opened by the rush of air upward, but when it rises it is closed by the pressure of the air above it; a few strokes in this way remove the air from within the pump, and the consequence is that the air in the well, but outside of the pump, forces the water upward to fill the vac'-u-um.

16. It is from such wells as these that the oil called petroleum is obtained, which is used for oiling machinery and for burning in lamps. It is from this that kerosene is now made.

XII. CAPES, ISLANDS, ETC.

Points of land which project into the water are called **Capes.** A high cape is called a **Promontory.**

Two of the best known capes are **Cape Horn** and **Cape Good Hope.**

2. A narrow neck or strip of land is called an **Isthmus;** and a narrow passage of water is called a **Strait,** sometimes a **Channel.** A well known isthmus is that of **Panama,** or Darien, which joins North and South America. A well known strait is that of **Gibraltar,** which connects the **Mediterranean Sea** with the **Atlantic Ocean;** another is **Behring Strait,** which separates North America from Asia and connects the Arctic with the Pacific Ocean; another, called **Davis Strait,** connects Baffin Bay with the Atlantic; and another, called **Hudson Strait,** connects Hudson Bay with the Atlantic.

3. These straits received their names from distinguished navigators who discovered them.

4. Hudson entered Hudson Strait and discovered Hudson Bay, which he thought was the Pacific Ocean; but, of course, he was mistaken.

He also explored Hudson River.

5. What is the difference between an Island and a Peninsula? *An Island is entirely surrounded by water, and a Peninsula is almost surrounded by water.*

6. You know what a **Tunnel** is. A celebrated tunnel is in the western part of Massachusetts. It is cut through the mountains and is nearly five miles long; it is the Hoosac Tunnel. The Mount Cenis (*se-ne'*) tunnel through the Alps is nearly eight miles long. Several tunnels pass under the Thames, the river which flows through the city of London. It is proposed to construct a railroad tunnel under the Hudson River between New York and Jersey City.

XIII. CANALS.

Canal-boats are drawn by horses or mules. Some are moved by steam. Canals are artificial rivers.

2. There is one in the State of New York that is three hundred and fifty-two miles long.

It reaches from **Lake Erie** to the **Hudson River;** and this canal has done much to make the city, as well as the State, of **New York** so large and and wealthy as it is.

3. If you will look at your map you will see that any kind of produce from the farms, the forests, or the mines can be brought by vessels from the far western shore of **Lake Superior** or of **Lake Michigan,** many hundreds of miles distant, all the way by water to **Buffalo,** thence by this long canal to the **Hudson River,** and down this river to the wharves of **New York City,** from which it can reach all the navigable waters in the world. This water-carriage is the cheapest of all. There are no rails to be paid for or to put down, but any man can move about wherever he chooses, up and down the navigable rivers, or to and fro for thousands of miles "over the broad bosom of the ocean."

4. The only difficulty about some canals is that they will freeze up in winter. Then the railroads get the better of them, and carry large quantities of goods during the long winter months.

5. This large canal, however, which is called the Erie Canal, is only about half as long as one

in **China,** which runs from the great city of **Pekin** to the great river **Yangtse Kiang.** There are said to be about four hundred canals in **China.**

6. In canals they have a curious way of making boats climb up hill; for canals must sometimes be made on ground that is high in one part and low in another. Where a high and a low level meet, it is necessary to build what is called a lock, perhaps because it locks the parts together. This is a shaft or well-hole of stone, carefully laid in cement so as to be water-tight, extending down from the upper to the lower level of the canal with a gate on one side, at the bottom, opening into the lower level, and another on the opposite side, at the top, opening into the upper level. These gates or doors can be shut so as to be water-tight.

7. When a boat is to go up hill, the door at the top being closed, the one at the bottom is opened, and the boat floats through into the lock.

8. That door is then closed and the upper one, or a valve in it, is gradually opened, letting the water run down into the lock until the

water in the lock is on a level with that in the upper canal. The upper door or gate is then opened, and the boat floats out upper level.

9. When a boat is to go from a high to a low level, the order of opening and closing the gates is simply reversed.

XIV. AQUEDUCTS AND BRIDGES.

An aqueduct is a long pipe for conducting water. It is made of lead or iron or earthenware, or sometimes it is a large tube of masonwork covered over smoothly with cement so as to be water-tight.

2. A tube or pipe can conduct water downwards, then upwards as high as its source, but no higher, on the principle that "water always seeks a level."

3. A most extraordinary aqueduct supplies the **City of Chicago** with water. It runs under the bottom of **Lake Michigan** for two miles, and communicates with a large iron pipe, which rises nearly to the surface of the lake. The

City of Cleveland, Ohio, is supplied with pure water from **Lake Erie** in a similar manner.

4. A Suspension Bridge is made by building two tall piers and stretching over them large wire ropes or cables.

5. To these cables are fastened iron rods which hold the floor on which people walk, wagons and trains of cars pass.

6. The oldest suspension bridges are in China. The Indians in South America make them of bark ropes, and sometimes, instead of a floor for the traveler to walk on, there is a basket into which he is put, and in which he is pulled over from one side of a river to the other.

7. Light suspension bridges are sometimes broken by too much vibration. This happened to a small bridge over the river **Loire,** in **France,** at a place called Angers.

8. Suspension bridges are so called because the floor or roadway is hung or suspended from the curved cables. Other bridges are built of stone, iron, wood, or brick; their roadways are usually over or alongside of the arches.

9. A most remarkable bridge (not suspension) is that which crosses the **Mississippi River** at the great city of **St. Louis.** This bridge is chiefly of steel, its three immense arches resting on four stone piers. Each span is over 500 feet in extent. There are two roadways, one above the other.

10. When you look at the foundations of bridges, lighthouses, and stone piers which are under water, you doubtless wonder how the masons built them. I shall now tell you. One way is to sink or drive down heavy timbers or piles around the place selected for the foundation, fill all around and between these with stone, clay, and cement, and pump out the water from the enclosure; the workmen then descend and build the foundation.

11. Another way is simply for the workman to put on a peculiar kind of a suit made of India-rubber, which completely covers him and keeps out the water. Glass is fixed in the helmet for him to see through. Of course, he must have air to breathe; that is supplied by a hose or tube leading from the inside of his suit or covering up to a boat, where other men are

carefully pumping air to him through the hose. In such suits, men go under the water to examine and repair ships, recover wrecks, sunken treasures, etc.

12. The diving-bell is another means by which men descend and work in the water.

XV. BALLOONS.

The first balloons were made in 1783, of paper, and were made to rise by heated air coming from chopped straw that was burned in a wire grating below them. This heated air, being lighter than the common air about it, makes the balloon rise up, just as a cork does in water. (Afterwards pure hydrogen gas was used, and then carburetted hydrogen, which is what we burn in our houses.)

2. A balloon moves about very easily in the air, so that a very slight change of weight will affect it seriously.

3. Soon after the invention of balloons they were used in war, being held fast by a long

rope, while some officers looked down from them to see what was going on in the enemy's camp.

4. In the last war in the United States a balloon corps (*kor*) was organized, and news was telegraphed from these balloons to headquarters.

5. There is not a more moving story than that of an Italian count or nobleman who, during an aerial journey on October the 7th, 1804, was cast away on the waves of the Adriatic.

6. He with two companions entered the balloons, they rose gently at first and hovered over the town of Bologna.

7. The count says: "We rose higher and higher; it became very cold. It was now two o'clock. The compass had been broken, and was useless; the wax light in the lantern would not burn in such a rarefied atmosphere.

8. "We descended gently across a thick layer of whitish clouds, and when we had got below them, we heard a sound, muffled and almost inaudible, which he immediately rec'ognized as the breaking of waves in the distance.

9. "Instantly I saw this new and fearful

danger. The sound of the waves, tossing with wild uproar, became louder and louder, and I suddenly saw the surface of the sea violently agitated just below us.

10. "I immediately seized a large sack of sand, but had not time to throw it over before we were all in the water, gallery and all. In the first moment of fright, we threw into the sea everything that would lighten the balloon—our ballast, all our instruments, a portion of our clothing, our money, and the oars. As, in spite of all this, the balloon did not rise, we threw over our lamp also.

11. "After having torn and cut away everything that did not appear to us to be of indispen'sable necessity, the balloon, thus very much lightened, rose all at once, but with such rapidity and to such a prodigious elevation, that we had difficulty in hearing each other, even when shouting at the top of our voices.

12. "I was very ill; one of my companions was bleeding at the nose; we were all breathing short and hard, and felt oppression on the chest.

13. "After having been at an immeasurable

elevation for half an hour, the balloon slowly began to descend and at last we fell again into the sea.

14. "The night was very dark, the sea rolling heavily; it must have been in the middle of the Adriatic that we fell. Although we descended gently, the gallery was sunk, and we were often entirely covered with water.

15. "The wind pressed against the half empty balloon as against a sail, so that by means of it we were dragged and beaten about at the mercy of the storm and the waves.

16. "At daybreak we found ourselves four miles from the shore. We were comforting ourselves with the prospect of a safe landing, when a wind from the land drove us with violence away over the open sea.

17. "It was now full day, but all we could see were the sea, the sky, and the death that threatened us. Certainly some boats happened to come within sight; but no sooner did their men see the balloon floating and shining upon the water than they hurried to get away from it.

18. "At last, one man better informed than

those we had seen before, recognized our machine to be a balloon, and quickly sent his long-boat to our res'cue. The sailors threw us a stout cable which we attached to the gallery, and by means of which they res'cued us when fainting from exposure.

19. "The balloon, thus lightened, rose in the air and, in spite of all the efforts of the sailors who wished to capture it, disappeared for ever from our view. It was eight o'clock in the morning when we were taken on board.

20. "The brave captain of the vessel did everything in his power to restore us. All were very sick; I was compelled to have my hands amputated."

II.

I. TREES AND PLANTS.

Trees and other plants are very useful to us, and we ought to be very grateful for them. We eat them, we wear them, we walk on them, we sit on them, we sleep on them, and are sheltered by them all day and all night. Our shirts and collars of muslin and of linen are given us by the cotton-plant and the flax. We sit down on chairs of oak or maple, or some other wood, which rest on a wooden floor, on which we walk. For our dinner-table the potato-plant has sent us its roots, or rather tubers; the wheat or rye gives us our bread; the tomato, the carrot, the turnip, the squash, the egg-plant, and a host of others all help to supply us with food, while apples, peaches, pears, grapes, and other delicious fruits are held out to us by many trees, bushes, and vines.

2. If we wish to build a carriage, omnibus, cart, wagon, car, or railroad, the oak, the ash, the maple, the chestnut, the pine, and other trees supply us with materials for them all.

3. If we wish to go across the ocean, the trees supply us with materials for ships.

4. If we go as far as the island of **Ceylon,** one tree there, called the bread-fruit tree, will supply us with bread, which hangs in small loaves from the branches. All you have to do is to take it and bake it and eat it.

5. If you go to **China** or **Japan,** you will find the tea-plant, that gives us a pleasant drink, and you will find there also about twenty different kinds of rice. Besides these is a tallow-tree, that supplies materials for candles.

6. If you should sail to **Brazil, Arabia, Abyssinia,** or other warm countries, or to the Island of **Java,** you would see fields covered with evergreen plants bearing small berries which furnish a part of the breakfast for many millions of people every day. What is it? *Coffee.*

7. In **Africa** and **Asia** are many kinds of palm. These supply cocoanuts, palm-sugar, palm-

wine, and palm-oil. The latter is used in this country to make soap, and perhaps some of you have washed your hands with this very palm-soap.

8. Some of you, perhaps, have eaten sago in pudding. Sago comes from a kind of palm, and a very wonderful tree it is.

9. Another palm that grows in **Egypt** gives us a kind of gingerbread all ready for us to eat. It is called the Doum palm.

10. Some trees in **South America** and **Africa** are called cow-trees, because they give a kind of milk.

11. Besides the trees that furnish bread and milk, there are others that yield a substance like butter. Of these the African tree seems the best, for the butter from it is sweet, white, and firm, and will keep for a year without salting.

12. Besides bread, milk, and butter, plants yield also sugar. This we have from the sugar-cane, from the maple-tree, and from the beet-root. Enough is made from this latter in **France** to supply that whole country. It is just as clear and sweet as the best loaf-sugar manufactured from the sugar-cane. From the sorghum we get

a sweet syrup, and from potatoes and other vegetables a sweet liquid called glucose is obtained, which is sometimes used to adulterate sugars and syrups.

13. The plants that poison us are very curious. Some men are dreadfully poisoned if they merely pass near some of them. Other men can handle these same plants without being at all affected by them. There is one tree in the **West Indies** from which, if the rain drips upon a man's skin, huge blotches are raised up immediately. Some of these poison plants kill us quietly, sending numbness all through our bodies, and others kill us with terrible convulsions.

14. There is one very curious plant that poisons us or nourishes us, according to the part we take. It is called the manioc, or cassava. It grows usually to the height of six or eight feet. Its roots are very large, sometimes weighing thirty pounds, and growing from three to eight in a cluster, usually from a foot to two feet long. Like the other parts of the plant, these contain an acrid, milky juice, so poisonous as to cause death in a few minutes; but, as this is

owing to the presence of a poisonous acid which is quickly driven out by heat, the juice, thickened by boiling, forms an excellent sauce called cassa-reep.

15. The root, grated or pounded into pulp, after yielding this deadly juice by pressure, is dried, and forms the well-known cassava-bread; or else, heated and stirred on metal plates, it forms the well-known tapioca, which is sold in our stores, and served up in our restaurants and in our families as tapioca pudding, which perhaps some in this class have eaten. Thus life or death comes to us from this plant, according to our knowing how to use it.

16. In the size of plants there is wonderful variety. There are some plants so small that we only know of their existence by their changing the color of the rocks and stones on which they grow. To see their stems and leaves it is necessary to use the microscope.

17. From these small specimens, plants vary in size up to the giant trees of **California**, that stand 90 or 100 feet in girth and tower up to the height of 300 or 400 feet.

18. The bark of some trees is used to

cover houses; that of the cork-trees of **Portugal** and **Spain** gives us all our corks; a certain tree from **Peru** gives us, in its bark, the fever-curing medicines called quinine and cinchona. The slippery elm gives also a medicinal bark. Cassia and cinnamon are the bark of certain kinds of laurel that grow in the **East Indies.** The oak, the hemlock, and other trees enable us, by means of their bark, to make leather out of hides by a process called tanning. Boats also are made of bark; chiefly birch and spruce.

19. There are some plants that seem offended if you touch them, and close up their leaves immediately. These are called sensitive plants. The best one comes from **Brazil.** There is a plant of this kind in our Southern States, but it is not so sensitive.

20. The plants which furnish us with most of our food are wheat, Indian corn, rice, and potatoes.

21. This country sends immense quantities of wheat and corn to Europe every year. They are cultivated extensively in California and the States which touch the **Great Lakes** and the **Missouri River.**

22. Countries besides ours which are celebrated for wheat are **Russia, France,** and **Austria.**

23. Rice is used for food more than any other grain. Millions of the inhabitants of **Asia** make it their chief article of agriculture and food.

24. The excellent rice for which **South Carolina** is celebrated is due to a few seeds left there by a vessel from **Madagascar** over two hundred years ago.

25. Rice grows also in other warm countries. A wild kind of rice grows in the swamps and lakes of **Minnesota.**

26. Indian corn is, next to rice, the most used. It originated in America long before the discovery by Columbus.

27. The potato is the most useful and the most extensively cultivated of all vegetables. It is a native of **South America** and it still grows wild in **Peru** and **Chili;** it was first taken to Spain and England about three hundred years ago.

28. Potatoes are more extensively cultivated in New York than in any other state; they are largely used in the manufacture of starch.

29. There is another plant which is also very extensively used in all parts of the world, and which, like the potato, was first found and cultivated by the natives in America, before the discovery of America; it is tobacco. Tobacco grows best in warm countries; the ancient Mexicans raised large crops of it.

30. Now it is extensively cultivated in **Kentucky, Virginia, Pennsylvania, Ohio, Tennessee, N. Carolina,** and **Maryland;** also in **Cuba, China, Japan, Persia,** and Southern Europe.

31. Chocolate is prepared from the seeds of the chocolate or cacao tree, which grows abundantly in **Central** and **South America** and the **West Indies.**

32. Tea consists of the leaves of the tea-plant, dried first in the sun, then in heated pans, and rolled. The color depends chiefly upon the age of the leaves when plucked, and upon their preparation. Materials for coloring the leaves are often used.

33. The plant, which is kept pruned down to the height of about five feet, grows abundantly in **China** and **Japan.**

34. Grapes flourish in countries which have

warm or moderately warm climates.

35. The central and southern parts of **France** and **Germany,** and nearly all parts of **Spain, Portugal,** and **Italy,** are especially noted for their extensive vineyards, and for the great quantities of wine made from the grapes.

36. The vines are mostly kept trimmed down, and not allowed to grow as high as a man's head.

37. In the vintage season, or when the grapes are ripe, men, women, and children go into the vineyards and pluck off the bunches, filling their boxes or baskets, which are emptied into huge tubs. When these are full, they are hauled in carts by oxen to the press-house, where the juice is pressed out and left to ferment, thus producing wine.

38. From **Spain** we get our raisins, which are grapes dried and prepared; and you will be surprised to hear that the currants which you have eaten in cakes and puddings are not the fruit of what we call currant bushes, but really a very small kind of grape which grows in Greece, and is prepared there for shipment to the United States and other countries.

39. Besides grapes, the countries of Southern Europe raise grain and vegetables in abundance; even between the rows of vines you may see wheat, or corn, or beet, or other plants growing. There are also great orchards or groves of mulberry trees, which feed the silkworm; of olive trees, from the fruit of which olive or sweet oil is made; and of orange and lemon trees.

40. Orange trees require a warm climate. They are killed by severe frost. In the United States they are cultivated in **Florida, Louisiana, Texas,** and in the southern part of **California.**

41. Most of the oranges sold in the United States are from the countries bordering on the **Mediterranean Sea,** and from the **West Indies.**

42. In cooler countries, apple trees grow abundantly. Introduced into America by the early settlers of New England, the apple is more extensively used in this country than any other fruit. Large quantities are sent to the cider-mill, pressed between rollers, and their juice converted into cider.

43. Of all the plants, one of the most useful and valuable is cotton. It grows only in temperate and warm climates, especially in our

Southern States. Mississippi, and the other States which border on the Gulf of Mexico, yield the most.

44. It grows from seeds, and bears a pod or bŏll, which bursts open in the autumn from the pressure of the soft, white, downy substance within, called cotton. This is picked out of the bŏll, and carried to a cotton-gin (*jin*), by which it is separated from the seeds. It is then pressed and packed in bales, and sent to the cotton mills to be spun into thread, then woven into muslin, calico, etc.

45. About one-half of the annual crop is sent to Europe, principally to England, where it is manufactured into cloth, then shipped to China, Japan, South America, and other places, and sold or exchanged for tea, silk, fancy articles, coffee, India-rubber, etc.

46. Besides cotton, there is another plant which is very useful in furnishing us with material for clothing. What is that? *Flax, from which linen is made.*

47. Linen is a kind of cloth made from a material obtained from the plant called flax. This grows to the height of two or three feet. It has slender stalks, which are covered with a bark

or skin containing fibers or a thread-like substance. Flax grows from seed sown in the spring; it is pulled out by the roots in summer, and after drying, soaking, scutching or beating, and other processes, the fibers are separated from the other portions of the bark, spun into thread, and woven into cloth called linen, cambric, lawn, tablecloths, towels, etc.

48. The seeds of the flax are called linseed. Like those of the cotton plant, they yield a useful oil and a substance which is made into food for cattle.

49. You have learned something about the two plants which are celebrated for furnishing materials for clothing—cotton and linen. There is another plant, rather a large tree, which yields a very useful substance; not fruit, nor its seeds, nor its bark, nor its roots, but its sap. In that respect it resembles the sugar maple tree, but we cannot eat any part of the tree. We wear articles made from it, yet it cannot be spun or woven like cotton or linen. Do you know what tree it is? *The India-rubber tree.*

50. India-rubber, or Caoutchouc (pronounced koo-chook'), is the milky sap of that tree. Cuts

or gashes are made in the bark, into which cups are inserted for collecting the sap. This is afterwards hardened by heat, the smoke giving it a dark color. It is further hardened by sulphur.

51. There is another tree which is valuable for its sap, called turpentine. This is obtained in a similar manner; when distilled, it yields rosin or resin and the oil or spirits of turpentine, both of which are used in the manufacture of varnish, and for other purposes. What is the name of the tree, and where does it grow? *The pine, which grows extensively in the sandy soil of* **North Carolina** *and the neighboring States. It grows also in other parts of North America and in Europe.*

52. Some of these trees are cut down and their roots and branches piled up, covered with turf or earth, and set on fire, to make charcoal and tar; the latter is the sap, which runs into a large iron vessel underneath the pile, and is conducted by pipes into casks near by. This costitutes an important occupation in **North Carolina, Canada,** and **Sweden.**

53. What is ivory? *A hard, white substance which forms the tusks of the elephant.* There is a kind of tree growing along some of the streams

in the northern part of South America which is called the vegetable-ivory tree; its seeds or nuts contain a juice which hardens into a substance resembling ivory.

54. Those trees which yield wood used chiefly in the manufacture of pianos, boxes, furniture, etc., are the mahogany and rosewood, which come from **Brazil, Central America,** and the **West Indies.** Some of these trees are sawed into layers about one-eighth of an inch in thickness, called veneer, which is used to cover over cheaper woods.

55. Several thousand dollars have been paid for the logs from a single tree. The forests on the coast of **Honduras** supply large quantities of mahogany; but the best sorts, called Spanish mahogany, are found in **Cuba** and **St. Domingo.**

56. All of you have seen an apple tree, and know the various forms of food into which its fruit can be made; but do you know where and how the tree gets the food which it lives upon? Let us talk about this.

57. The substances which supply it with its food or nourishment are in the ground and the air. The principal substances are called

carbon, hydrogen, and oxygen.

58. Many thousands of little mouths in the roots are ever on the alert for these substances, which go to make wood, leaves, and fruit; taking them in with the water in the soil, and sending sap upward to every branch, twig, and leaf.

59. The leaves, too, are at work all day long, breathing in through their countless pores, or mouths, moisture from the atmosphere, and, with the aid of sunlight, changing and preparing the sap. Then the sap returns toward the roots, supplying on its way what is needed for every part of the tree.

60. The roots, trunk, and branches, contain multitudes of little tubes or pipes, through which the sap flows; one set for the rising sap, and another set for the returning sap. The sap is to a tree what blood is to an animal, and both the sap and blood are always in circulation.

61. Does the apple tree enlarge on the inside, or outside; by the rising, or the returning sap? *The increase is on the outside of the hard wood, or just along the inner bark, and is supplied by the returning sap.*

62. Every year a layer is added; therefore, when such a tree is sawed across the trunk, the layers will appear like rings and show the age of the tree. In counting the rings, the pith and the bark, belonging to the first year's growth, are not to be included.

63. Trees which thus grow by additions to the outside of the hard wood, or externally, are called exogens (*ex'-o-jens*); such include apple, pear, maple, elm, and many other kinds of trees.

64. Trees and plants which increase by internal growth, showing no layers or rings like those above named, are called *en'-do-gens*, such as palm-trees, Indian corn, sugar-cane, wheat, grasses, etc.

65. Trees and plants are multiplied in various ways: by seeds, as acorns, grain and cotton-seed; by cuttings, as the grape-vine, sugar-cane, and geraniums; by dividing or separating roots, tubers, and bulbs, as the strawberry, potato, dahlia, and hyacinth; and by grafting.

66. Vegetation is extended over the land not only by men, but also by the winds, streams, ocean-currents, birds, bees, etc.

67. Many seeds are provided with a kind of wing or some light substance, and are scattered far and wide by the winds, as those of the ash, elm, and maple trees, the thistle and the dandelion.

68. Placed in the ground, the seed sends down its roots to find food or nourishment and also to hold the plant firmly in its place. Then the stem appears above ground. When the plant is grown and perfect, it consists of these five parts: root, stem or trunk, leaves, flowers, and fruit.

69. At the end of every little root is a kind of mouth; and, as different kinds of plants require different kinds of nourishment, these little roots, which appear like bunches of threads, keep spreading themselves in the ground in search of the particular substances just suited to the plant which it is their duty to supply.

70. So you may consider the roots and their mouths to be the storehouse and food-gatherers; the long, narrow pipes in the stem or trunk, the channels or means of conveyance; and the leaves to be a kind of stomach or manufactory for preparing the food and making

it fit for use. That is, all parts of a tree or plant act in harmony with each other for some good purpose.

71. There are different kinds of roots: 1st, those of forest trees, which extend in various directions and sometimes to greater distances than the trunk and its branches; 2d, those which appear like a bunch of threads or fibers, and which are called fibrous, as those of the hyacinth and grasses; 3d, those associated with tubers, like the potato, and which are called fleshy roots; 4th, those which taper downward and send out fibers from their sides, like the carrot and parsnip.

72. Roots are divided also into different kinds, according to their length of life; into annual, or those which live but one year; bi-en'ni-al, those which live but two years; and per-en'ni-al, those which live several years.

73. Trees differ also in their stems or trunks; some grow up for a short distance from the ground and then branch out in every direction, like the apple tree; while others grow up almost in a straight line, ten times as high as any apple tree; such are the mammoth trees of California, the eucalyptus trees of Australia, and

the cocoanut trees of Africa and Asia.

74. Trees which lose their leaves in autumn are called de-cid'u-ous, which means *falling off*. Those which retain their leaves through the winter, or until new leaves appear, are called evergreen. An apple tree is deciduous, and a hemlock is evergreen.

75. Leaves differ from each other very greatly in their size, shape, color, and construction; some have smooth edges, while others have saw-like edges; some are long and narrow, like those of Indian corn and the sugar cane, while others are broad and round, like the cabbage and begonia. Leaves differ from each other also in regard to the number and arrangement of their veins.

76. Seeds differ very greatly from each other. Some are inside of the fruit, like those of the apple; some are on the outside, like those of the strawberry; others are together, forming the fruit, like those of the blackberry.

77. Some seeds furnish us with flour, from which our bread is made, as wheat; or with meal, as Indian corn; while many others are not used for food in any form.

78. Some seeds are enclosed in a pod capsule, or case, like those of peas, pansies, violets, and lady-slippers; while others consist of a kernel and hard shell, like the hickory nut.

79. When rambling in the woods, you should examine some of the various plants, roots, leaves, flowers, fruits and seeds which you see. You will thus be easily led to the study of that delightful science called *BOTANY*, to which your attention has been directed in this chapter.

II. THE VIOLET'S COMPLAINT.

"I wonder what I was created for—I am so weak and small," thought a violet, as it shook off a dew-drop which weighed it to the ground. "Surrounded by these leaves which shut me in from the world, bowed down under the weight of the morning dews, I must spend a worthless existence, unknown and uncared for."

2. "How I envy yonder oak! how proudly it stands! what cares it for the winds, or storm. Its branches laugh and wrestle in the breezes

that cause me to bow my head in fear. Even the cattle love its cooling shade, and there they rest from the burning sun. It has its work to do, while I—but hark! I heard the sound of thunder, I must hide my head beneath the shelter of these dark green leaves until the storm of wind and rain is past."

3. An hour passed; the storm was over; again the sun looked down upon the earth, refreshed by cooling rain. Lifting its dripping head, the violet gazed in wonder; the oak, unable to bend to the storm, had yielded to a stronger power, and now lay shattered and prone upon the ground.

4. "My weakness has been my safeguard," murmured the violet, in a subdued, shamed tone.

5. Just then a voice exclaimed: "Dear little violet, just what I have been looking for;" and a hand reached down and plucked it from its home among the leaves, and carried it tenderly to a sick girl's home. "See, Emma, I have brought you the first violet of the season; it was the only one that I could find. Here, let me put it into this little vase beside your bed."

6. "How kind you were, Ethel, to find it for me. I love violets so much;" and the thin,

pale hand reached out and took the vase, and gazed upon the little flower. "It is so sweet," she said, "it seems to bring new life and hope to me."

7. Once more the violet was heard to murmur: "I was mistaken; I have a work to do. God has not created anything in vain."

N. Y. Observer.

III. IN THE WOODS.

To'wards August or September, any man who has once been in the woods will begin to feel stirring within him a restless craving for the forest.

2. To a man who has once tasted of the woods, the instinct to return thither is as strong as that of the salmon to seek the sea. Let us, then, go into the woods. We have arrived at the last house, where Indians and canoes' are waiting for us. Old John Williams, the Indian, beaming with smiles, shakes hands, and says: "I am glad to see you back again in the woods

of Canada. How have you been, sir? Pretty smart, I hope." "Oh, first-rate, thank you, John; and how did you get through the winter, and how is the farm getting on?" "Pretty well, sir. I killed a fine fat moose last December, that kept me in meat almost all winter; and the farm is getting on splendidly. I was just cutting my oats when I got your telegram, and dropped the scythe right there in the swath, and left."

3. The first day is not pleasant. The canoes have to be carted ten miles to the head of the stream we propose descending and the hay-wagon wants mending, or the oxen have gone astray. Patience and perseverance, however, overcome all these and similar difficulties, and at last we arrive at the margin of a ti'ny stream.

4. Down we go, very slowly and carefully, until the water deepens. We then take to the paddles and make rapid progress.

5. After a mile of still water we are brought up by a beaver-dam, showing an almost dry river-bed below it. Canoes are drawn up and the dam is demolished in a few minutes, giving a couple of nights' hard labor to the industrious families whose houses we had passed a little way above

the dam. We have to wait for half an hour to give the water a start of us, and then off again, poling, wading, and paddling down the stream, until the sinking sun indicates time to camp.

6. In a few minutes, canoes are unladen, two tents pitched, soft beds of fir-tops spread evenly within them, wood cut, and bright fires kindled more for cheerfulness than warmth. A box of hard bread is opened, tea made, and supper is ready.

7. Sunrise finds us up; breakfast is soon over, tents are struck, canoes loaded, and we are on our way down the deepening stream. It is a river now, with plenty of trout in the shallows, and salmon in the deep pools. About noon we turn sharp off to the eastward up a little brawling brook, forcing our way with some difficulty up its shallow rapids till it gets too dry, and we are compelled to go ashore and to "carry" over to the lake whither we are bound. One of us stops behind to make a fire, boil the kettle, and prepare the dinner, while each Indian swings a canoe on his shoulders and starts through the woods. In three trips everything is carried across and we embark upon a lovely lake.

8. The "carry" was not long, and there was a good blazed trail, so that it was a comparatively easy job; but under the most favorable circumstances this portaging, or carrying, is very hard work. It is hard enough to have to lift eighty or one hundred pounds on your back. It is worse when you have to carry the burden half a mile, and get back as quickly as you can for another load; and when you have to crawl under fallen limbs, climb over prostrate logs, balance yourself on slippery tree-trunks, flounder through bogs, get tangled up in alder swamps, force yourself through branches which slap you viciously in the face, with a big load on your back, a hot sun overhead, and several mosquitoes on your nose, it is almost beyond endurance. But it has to be done, and the best way is to take it coolly.

9. Out on the lake it was blowing a gale, and right against us. We had to kneel in the bottom of the canoes, and vigorously ply our paddles. The heavily-laden craft plunged into the waves, shipping water at every jump, and sending the spray flying into our faces. Sometimes we would make good way, and then, in a

squall, we would not gain an inch, and be almost driven on shore; but after much labor we gained the shelter of a projecting point, and late in the evening reached our destination, and drew up our canoes for the last time.

10. The Indian carries your blanket, your coat, a little tea, sugar, and bread, a kettle, and two tin pans. The hunter has enough to do to carry himself, his rifle, ammunition, a small axe, hunting-knife, and a pair of field-glasses. Thus provided, you plunge into the woods, the sun your guide in clear weather, your pocket-compass if it is cloudy, the beasts and birds and fishes your companions, and wander through the woods at will, sleeping where the fancy seizes you, "calling" if the nights are calm, or still-hunting on a windy day. Calling is the most fascinating, disappointing and exciting of all sports.

11. Moose-calling consists in imitating the cry of the animal with a hollow cone made of birch bark, and endeavoring, by this means, to call up a moose near enough to get a shot at him by moonlight or in the early morning. He will come straight up to you, within a few yards—walk right over you almost—answering, ("speaking," as the Indians term it,) as he comes along, if nothing happen to scare him.

12. The great advantage of moose-calling is, that it takes one out in the woods during the most beautiful period of the whole year; when nature, tired with the labor of spring and summer, puts on her holiday garments, and rests luxuriously before falling into the deep sleep of winter. The great heats are past, though the days are still warm and sunny; the nights are calm and peaceful, the mornings cool, the evenings so rich in coloring that they seem to dye the whole woodland with sunset hues; for the maple, oak, birch, and beech trees glow with a gorgeousness unknown to similar trees in England.

13. If the day is windy you can track the moose and the car'iboo, or perchance a bear, through the deep, shady recess'es of the forest. On a still day you may steal noiselessly over the smooth surface of some lake, or along a quiet reach of a river.

14. Just beyond us is a little clump of pines, and all around, a gray meadow, quite open for about fifty yards, then dotted with occasional firs with long tresses of gray moss hanging from

their stunted limbs. The trees grow closer and more vigorous till they merge into the gloomy, unbroken forest beyond.

15. Haunting these solitudes are birds and beasts, the hooting owl, the beaver, the wolf, the cariboo a kind of reindeer, and the huge, ungainly moose.

16. Scarcely had I sat down before I heard old John call gently like a moose to attract my attention. Now it must be borne in mind that, when hunting, you never call or speak like a human being, for to do so might scare away game; but you may grunt like a moose, hoot like an owl, or imitate any sound made by any of the brute creation. I crept up quickly, and in obedience to John's whisper gave him the moose-caller, and following the direction of his eyes, saw a small moose slowly crossing the barren some four or five hundred yards to our left.

17. The moose came on boldly. We planted ourselves right in his way, just on the edge of the woods, and crouching close to the ground, waited for him. Presently we heard his hoarse voice close to us, and the crackling of the bushes as he passed through them; then silence fell

again, and we heard nothing but the thumping of our hearts; another advance and he stopped once more, within apparently about fifty yards of us.

18. After a long, almost insupportable pause, he came on again; we could hear his footsteps, we could hear the grass rustling, we could hear him breathing, we could see the bushes shaking, but we could not make out even the faintest outline of him in the dark. Again he stopped, and our hearts seemed to stand still also with expectation; another step must have brought him out almost within reach of me, when suddenly there was a tremendous crash!

19. He had discovered us, and was off with a crackling of dead limbs, rattling of horns, and smashing of branches, which made the woods resound again. Disappointed we were, but not unhappy, for the first duty of the hunter is drill himself into that peculiar frame of mind which enables a man to exult when he is successful, and to accept defeat without giving way to despondency.

20. After awhile we espied a bear, and although having a good opportunity, I made a bad shot, striking the animal low too down on the shoulder, and only breaking his leg. With a

violent snort of pain and astonishment, but without looking round for a second to see what was the matter, away went "bruin" down the mountain-side at a most surprising pace. "Come on," yelled John; "try and head him off; if he once gets down into the timber he is gone sure." And away we went after him as hard as we could tear.

21. How John jumped and bounded and yelled, and how the bear did bound down that hillside! He seemed to go twice as fast on three legs as any other animal ever went on four. Sometimes John would head the bear and turn him, sometimes the bear would make a drive at John and turn him, which would give me time to get up; and so we went on yelling and whooping and plunging through the tangled, matted junipers, the bear doubling and twisting and sometimes charging us, but always struggling gallantly to gain the shelter of the woods.

22. I missed the bear several times, until at last with a successful shot I rolled him over, and John and I threw ourselves down exhausted beside his dead body.

EARL OF DUNRAVEN.

IV. MINING: COAL, IRON, ETC.

To get coal, men must sink a shaft; that is, they must dig a great hole in the ground until they come to where the coal is best and most abundant. The hole or shaft must be large enough for very large buckets full of coal to be raised up from the bottom; and to raise these there must be a steam-engine at the mouth of the shaft. This must have a house built over it to protect the machinery and the workmen.

2. Down below, at the bottom of the shaft, men are working away with pickaxes and shovels, making passages wherever they find coal. These passages are called galleries. In a coalminer's life there are many dangers. Sometimes the sides or roof of the gallery fall on him and crush him; sometimes the choke-damp (coal-gas, or carbonic acid) comes and chokes him to death; and sometimes the "fire-damp" (explosive gas) comes, and blows him like a bullet along the gallery or up the shaft, and sometimes it is strong enough to blow the mine to pieces, shattering the steam-engine and breaking into little

sticks the house that covers it.

3. It is curious to get into one of these big coal-buckets and be lowered down to the bottom of the shaft. What seemed from the top to be like little stars or glow-worms moving about below, turn out to be little lamps fastened in front of the miners' caps, so as to give them light and leave both their hands free to hold the pickaxe or the shovel.

4. When the coal has reached the top of the shaft, it is put into small cars that run on a sloping railroad or tramway, until it reaches a railroad, along which it is drawn to some place where it is sold for use, or to some place where it can be put into canalboats, or ships, and go wherever water goes.

5. Many coal-mines are reached from the side of a mountain or hill by way of a kind of tunnel instead of a shaft. Coal brought from the inside of the mine to the opening, mostly in small cars which are moved by horses or mules and sometimes by the miners themselves.

6. One kind of coal, called first in **Lancashire,** in **England,** cannel coal (that is, candle or can'le coal), will burn like pine wood. If you

take a splinter of it and hold it in the flame of a candle, it will take fire and continue to burn, giving out a light like a candle. This kind of coal can also be turned in the turning-lathe as wood is turned, and sometimes snuffboxes are made from it.

7. The gas we burn in our houses is made from coal, which, therefore, not only warms us in winter, but cooks our supper and gives us light to eat it by.

8. Many millions of tons of coal are produced every year. Our steamboats, ocean steamers, locomotives, and steam-engines use up many tons of this black fuel.

9. In this country what are called coal-fields have an extent of about 300,000 square miles. You must not imagine, however, that all this country looks black with coal. On the contrary, very little of it crops out on the surface, and you may have a very fine farm with all its trees and crops spread out over a valuable coal-mine, so that they may both be worked without interfering with one another.

10. You learned in the previous chapter how necessary leaves are to the life and growth of a

tree, and how valuable some kinds are, such as those of the tea and the tobacco plant; but do you see any use in the leaves of the forest after they have withered and fallen in the autumn?

11. If you should dig down in the ground you would see that the soil at the top is black and rich, while deeper down it is light-colored and poor. The blackness and richness of the surface soil is due chiefly to the withered leaves which fell from year to year and went to decay; thus you may trace back the abundance of your bread, through large crops of wheat and rich soil, to dead leaves or dead grass.

12. That is not all: geologists tell us, among many other wonderful and interesting things, that they have traced the coal which miners dig out of the earth away back to trees, plants, leaves, etc., which had become buried in great masses under the surface of the earth.

13. Just how all these immence beds of coal were made, learned men have not agreed. They appear to have been made in some mysterious manner, long, long ago, from trees, plants, and seeds (especially ferns and mosses), because the remains and impressions of such have

been found in them. It is also probable that the water on the earth, the heat inside of the earth, volcanic action, and several successive elevations and depressions of the surface had a good deal to do with the formation of coal.

14. Charcoal is made by covering, almost entirely, a large pile of wood with sod and earth and setting it on fire.

15. Coke bears the same relation to coal that charcoal does to wood. The coal is heated in air-tight iron vessels, from which tubes run into water, so that all the gas may bubble through into another vessel and be drawn thence to light our houses. Thus we contrive to make coke and gas at the same time.

16. The coke we burn in our grates to warm us; and the gas, in our gas-burners to give us light.

17. Iron is the most useful metal in the world; it is far more useful to us than gold and silver. Iron is very seldom found pure. It is almost always mixed with other substances, and this mixture is called iron ore. To get the iron from this, men build large furnaces of fire-proof brick, and after they have built a very hot fire

in the bottom of one of these they put in a quantity of iron ore, then about as much limestone broken up into a convenient size, and then on top of the limestone about as much coal.

18. Thus they keep putting in layers of ore, limestone, and coal until the whole furnace, which is sometimes sixty feet high, is filled up to the top. As the mass sinks down they put on more to keep the furnace always full. The fire burns all through this mass, so that the ore is melted; a part of which mixes with the heated limestone, making what is called slag, and leaving the iron free to run down below. This the iron is sure to do, because it is heavier than all the other things.

19. The fire in the furnace is kept up day and night, and on Sundays as well, because if they were to allow the fire to go out, it would take about a week to get it in order again. But the same men do not work at it all the time; there are two sets or gangs of them, and their time is arranged so that each gang shall have the same amount of night-work. Twice a day they let the melted iron run out of the furnace and conduct it along narrow earthen gutters into

hollows or molds of sand or iron, about three feet long and three inches wide as well as deep.

20. These, from their lying side by side like a litter of pigs, are called pig-iron. This is again melted to make anything of cast-iron, and is poured into very smooth earthen molds of the desired shape. All our iron stoves are made of such castings.

21. To make wrought-iron, the pig-iron is melted, and a convenient quantity is lifted out and beaten with hammers continually while hot, and in every direction, until it is sufficiently thus "wrought," which makes it tough and flexible.

22. This is then made into bars or chains or any other shape that is preferred. It is also rolled while hot between rollers with grooves in them so as to make long bars of different shapes and thicknesses for different purposes. Wire also is made from wrought-iron.

23. To make steel, this iron is heated again with charcoal; part of the charcoal goes into the iron and makes it capable of being tempered in the fire, so as to be made very hard and very elastic, taking thus a finer edge when

made into tools and ground. It is from this that we get all our knives, hatchets, axes, chisels, gouges, adzes, and other tools. Razors are made from the best and finest steel, and when carefully ground and sharpened have a very fine cutting edge.

24. The salt-mines in the nothern part of **Austria** are about 1,000 feet in depth and two miles in length. They contain many great rooms, galleries, and passages, all cut out by the miners. There are valuable salt-mines also in **Russia, England, Germany, Italy,** and **Spain.**

25. Salt is obtained not only from mines, but also from the water of the ocean, salt springs and wells.

26. Silver-mining is carried on very extensively in the States of **Nevada** and **Colorado,** where some men have become immensely rich almost in a single day, owing to the discovery of silver on their land.

27. Many of the mines are far up high mountains and reach to great distances within them.

28. Silver is found also in Utah, Montana, and other Territories of the United States. It

was formerly found in large quantities in Mexico, Bolivia, and Peru.

29. Gold, the most precious of all the metals is found not only in deep mines like those of iron, coal, or silver—

30. It has been found in the sands of streams, into which it has been carried from the crumbling rocks by rains, and from which it is obtained by washing. Considerable gold is obtained by directing a powerful stream of water against the rocks by means of a hose, which is supplied from large collections of water on higher ground. This is called hydraulic mining.

31. Pure gold is too soft for general use, therefore it is mixed with silver or copper, which are harder; it is then said to be *alloyed*, or reduced in purity.

32. For gilding, a portion of gold is hammered out into leaves so thin that several hundred of them together would be no thicker than one of the leaves of your book.

33. **California, Nevada,** and **Australia** have long been celebrated for gold.

34. Copper ore is found in several countries and States, especially in the **Republic of Chili**

and in the State of **Michigan,** along the shores of **Lake Superior.**

35. Tin ore is obtained principally from the mines of **England, Australia,** the **Malay Peninsula,** and two islands, **Banca** and **Billiton,** which lie southeast of that peninsula.

36. Tin is white and bright, but too soft for ordinary use; therefore, sheets of iron are dipped into melted tin, enough of which adheres to the iron to form a thin white coating. Sheet-iron thus coated is the substance of which tin cups, pans, etc., are made, and with which the roofs of some house are covered. You see, therefore, that a tin cup is really made of iron.

37. Bronze and bell-metal are made of copper and tin mixed together. Brass is made of copper and zinc mixed together. There are, consequently, no mines or ores of brass or bronze.

38. Zinc is a metal of a bluish gray tint. It is extensively mined in several countries in **Europe,** and in the States of **Wisconsin, Missouri, New Jersey,** and **Pennsylvania.**

39. Lead is mined very extensively in **Wisconsin, Illinois, Iowa,** and **Missouri.** It is used in roofing houses, lining tanks, and in making bullets, shot, and water-pipes.

40. Lead pencils are made of a mineral called plumbago, which is not lead, but a kind of coal. Extensive mines of this substance are found in **England** and **Siberia.**

V. DANGERS IN THE MINES.

"There is danger in the mines, old man," I said to an aged miner, who, with his arms bent, leaned against the side of an immense vault, absorbed in meditation; "it must be a fearful life."

2. The old man looked at me with a steadfast but somewhat vacant stare, and then in half-broken sentences he uttered, "Danger—where is there not?—on the earth or beneath it—in the mountain or in the valley—on the ocean or in the quiet of nature's most hidden spot—where is there not danger?—where has not death left some token of his presence?"

3. "True," I replied, "but the vicissitudes of life are various; the sailor seeks his living on

the waters, and he knows each moment that they may engulf him; the hunter braves death in the wild woods, and the soldier on the battle-field, and the miner knows not but the spot where he now stands, to-morrow may be his tomb."

4. "It is so, indeed;" replied the old man; "we find death in the means we seek to perpetuate life; 'tis a strange riddle; who shall solve it?"

5. "Have you long followed this occupation?" I asked, somewhat struck by the old man's manner.

6. "From a boy; I drew my first breath in the mines,—I shall yield it up in their gloom."

7. "You have seen some of those vicissitudes to which you have just alluded?"

8. "Yes!" he replied with a faltering voice, "I have; there was a time that three tall boys looked up to me and called me father. They were sturdy fellows! Now, it seems but yesterday that they stood before me so proud in their strength, and I was filled with a father's vanity."

9. "Where are they now?"

10. "I saw the youngest—he was the dearest

of the flock, his mother's spirit seemed to have settled on him—crushed at my feet, a bleeding mass. One moment, and his light laugh was in my ears; the next, and the large mass came. There was no cry—no look of terror; but transition to eternity was as the lightning's flash, and my poor boy lay crushed beneath the fearful load. It was an awful moment.

11. "But my cup of affliction was not yet full. I had still two sons. They, too, were taken from me. Side by side they died, the fire-damp caught their breath, and left them lifeless. They brought them home to the old man, and told him that he was childless and alone. It is a strange decree that the plant should thus survive the stripling things it shaded, and for whom it would have died a thousand times. Is it surprising that I should wish to die in the mines?"

12. "You have indeed," I replied, "been acquainted with grief. Whence did you derive consolation?"

13. Then old man looked up, "From heaven."

HOOD.

VI. MOUNTAINS, VOLCANOES.

Sometimes volcanoes throw out red-hot stones, sometimes melted stones called lava, sometimes smoke, and sometimes ashes. Most of them are along the **Pacific** coasts of Asia and South America. There are more than a thousand volcanoes in the world. They are useful in preventing earthquakes; in supplying us with sulphur, with some fine kinds of lava, from which bracelets and breast-pins are made, and with pumice-stone, which is the froth that floats sometimes on streams of lava.

2. The best-known volcano in the world is **Vesuvius,** which is in **Italy,** near the city of **Naples.** This was not known to be a volcano until the year 79, or about eighteen centuries ago, when it suddenly burst forth and sent out such an immense quantity of ashes and cinders as to overwhelm two cities situated near it. These cities were named Herculaneum and Pompeii (*pom-pay'e*). Almost all their inhabitants managed to escape. The ashes that fell upon Herculaneum were mixed with steam, so that the moist ashes gradually hardened into stone.

3. Pompeii was covered over with dry ashes so completely that nothing could be seen of it. Thus it remained buried until 1748, when it was accidentally discovered. Excavations were then commenced and have continued to the present day. About one-third of the city has been uncovered, and you can now walk along the streets and look into the houses, and see exactly how people lived in those days.

4. Vesuvius frequently pours out lava, and travelers often stand close by a stream of lava flowing from it, and see smoke issuing from its crater.

VII. THE ERUPTION OF VESUVIUS.

Delightfully situated at the foot of Vesuvius, on the beautiful Bay of Naples, were the two cities of Pompeii and Hercula'neum, which, at the height of Rome's greatness, were famous resorts of Romans of wealth and rank. Beautiful vineyards and gardens covered the mountain slopes, and heathen temples, baths, statues, fountains,

and mosaic pavements adorned the towns. This, the first recorded eruption of the mountain, lasted eight days and nights.

2. Pliny the younger, a Roman author of that time, described the sudden appearance of a cloud which rose in the afternoon of August 24, A. D. 79, over Vesuvius, shooting upward to a great height and spreading at the top like a pine tree; then the showers of ashes and cinders which filled the atmosphere, producing intense darkness that continued three days. His uncle, the older Pliny, then admiral of the fleet near by, went to the assistance of the people on shore. Hot cinders fell on the decks of the ships, and flames were raging on the land.

3. Retreating to the shore in the intense darkness, protected with pillows on their heads, they found the sea too tempestuous for them to embark. The admiral lay down exhausted upon a sail on the shore, and his companions fled before the sulph'urous flames. Here his body was found three days afterward.

4. According to Bulwer, the immense amphithe'ater of Pompeii was crowded with people to witness cruel sports—the fighting of gladiators

and the destruction of a criminal by the lion and the tiger. These horrible performances were suddenly arrested.

I. The Last Days of Pompeii.

The eyes of the crowd beheld, with dismay, a vast vapor shooting from the summit of Vesuvius in the form of a gigantic pine-tree; the trunk, blackness—the branches fire!—a fire that shifted and wavered in its hues with every moment, now fiercely luminous, now of a dull and dying red, and that again blazed terrifically forth with intolerable glare!

2. There was a dead, heart-sunken silence; through which there suddenly broke the roar of the lion, that was echoed back from within the building by the sharper and fiercer yells of its fellow-beast. Dread se'ers were they of the Burden of the Atmosphere, and wild prophets of the wrath to come!

3. Then there arose on high the universal shrieks of women; the men stared at each other, but were dumb. At that moment they felt the earth shake under their feet; the walls of the theater trembled; and, beyond in the distance,

they heard the crash of falling roofs; an instant more, and the mountain cloud seemed to roll toward them, dark and rapid, like a torrent; at the same time, it cast forth from its bosom a shower of ashes mixed with vast fragments of burning stone!

4. Over the crushing vines, over the desolate streets, over the amphitheater itself, far and wide, with many a mighty splash in the agitated sea, fell that awfull shower!

5. No longer thought the crowd of vengeance or of sport; safety for themselves was their sole thought. Each turned to fly—each dashing, pressing, crushing against the other. Tramping recklessly over the fallen, amid groans, and oaths, and prayers, and sudden shrieks, the enormous crowd vomited itself forth through the numerous passages.

6. Whither should they fly! Some, anticipating a second earthquake, hastened to their homes to load themselves with their more costly goods, and escape while it was yet time; others, dreading the showers of ashes that now fell fast, torrent upon torrent, over the streets, rushed under the roofs of the nearest houses, or temples, or sheds (shelter of any kind), for protection from the terrors of the open air. But darker and larger and mightier spread the cloud above them. It was a sudden and more ghastly night rushing upon the realm of noon!

7. How the darkness gathers! What sudden blazes of lightning! How they dart and quiver!

8. What sound is that?—the hissing of fiery water! What! does the cloud give rain as well as flame?

9. Amid the other horrors, the mighty mountain now cast up columns of boiling water. Blent and kneaded with the half-burning ashes, the streams fell like seething mud over the streets in frequent intervals.

10. The streets were already thinned; the crowd had hastened to disperse itself under shelter; the ashes began to fill up the lower parts of the town; but, here and there, you heard the weary foot-steps of fugitives, or saw the pale and haggard faces by the blue glare of the lightning, or the more unsteady glare of torches, by which they endeavored to steer their steps. But ever and anon, the boiling water, the

straggling ashes, or mysterious and gusty winds rising and dying in a breath, extinguished these wandering lights, and with them the last living hope of those who bore them.

11. "Help there! Help!" cried a frightened voice, "I have fallen down—my torch has gone out—ten thousand sesterces to him who helps me—oh, help me, give me thy hand." See!—they have placed a light within yon arch at the gate; by that let us guide our steps.

12. The air became still for a few minutes; the lamp from the gate streamed out far and clear; the fugitives hurried on—they gained the gate—they passed by the Roman sentry; the lightning flashed over his liv'id face and his polished hel'met, but his stern features were composed even in his awe. He remained erect and motionless at his post. That hour itself had not animated the machine of the ruthless majesty of Rome into the reasoning and self-acting man. There he stood, amid the crashing elements; he had not received the permission to desert his station and escape.

II. Flames, Falling Ashes, and Stones.

The cloud, which had scattered so deep a murk'iness over the day, had now settled into a solid and impen'etrable mass. It resembled less even the thickest gloom of a night in the open air than the close and blind darkness of some narrow room. But in proportion as the blackness gathered, did the lightnings around Vesuvius increase in their viv'id and scorching glare.

2. Nor was their horrible beauty confined to the usual hues of fire; no rainbow ever ri'valed their varying dyes. Now brightly blue as the most azure depth of a southern sky—now of a liv'id and snakelike green, darting restlessly to and fro as the folds of an enormous serpent—now of a lu'rid and intolerable crimson, gushing forth through the columns of smoke, far and wide, and lighting up the whole city from arch to arch—then suddenly dying into a sickly paleness!

3. In the pauses of the showers, you heard the rumbling of the earth beneath and the groaning waves of the tortured sea; or, lower still,

and audible but to the watch of intensest fear, the grinding and hissing murmur of the escaping gases through the chasms of the distant mountain.

4. Sometimes the cloud appeared to break from its solid mass, and, by the lightning, to assume quaint and vast mimicries of human or of monster shapes, striding across the gloom hurtling one upon the other, and vanishing swiftly into the tur'bulent abyss' of shade; so that, to the eyes and fancies of the affrighted wanderers, the unsubstantial vapors were as the bodily forms of gigantic foes—the agents of terror and death.

5. The ashes in many places were already kneedeep; and the boiling showers which came from the steaming breath of the volcano forced their way into the houses, bearing with them a strong and suf'focating vapor.

6. In some places, immense fragments of rock, hurled upon the house roofs, bore down along the streets masses of confused ruin which, yet more and more with every hour, obstructed the way; and as the day advanced, the motion of the earth was more sensibly felt—the footing

seemed to slide and creep—nor could chariot or litter be kept steady, even on the most level ground.

7. Sometimes the huger stones striking against each other as they fell, broke into countless fragments, emitting sparks of fire, which caught whatever was combustible within their reach; and along the plains beyond the city the darkness was terribly relieved; for several houses, and even vineyards, had caught fire.

8. To add to this partial relief of the darkness, the citizens had, here and there in the more public places, such as the porticos of temples and the entrances to the forum endeavored to place rows of torches; but these rarely continued long; the showers and the winds extinguished them, and the sudden darkness into which their fitful light was converted had something in it doubly terrible and doubly impressive on the impotence of human hopes, the lesson of despair.

III. Darkness—The Sea Retreats.

Frequently, by the momentary light of these torches, parties of fugitives encountered each

other, some hurrying toward the sea, others flying from the sea back to the land, for the ocean had retreated rapidly from the shore. An utter darkness lay over it, and upon its groaning and tossing waves, the storm of cinders and rocks fell and without the protection which the streets and roofs afforded on the land.

2. Wild, haggard, ghastly with su′pernatural fears, these groups encountered each other, but without the leisure to speak, consult, or advise; for the showers fell frequently, though not continuously, extinguishing the lights, which showed to each band the death-like faces of the other, and hurrying all to seek ref′uge beneath the nearest shelter.

3. All the elements of civilization seemed to be broken up.

4. Ever and anon, by the flickering light, you saw thief hastening by the most solemn authorities of the law, laden with, and fearfully chuckling over, the produce of his sudden gains.

5. If in the darkness, wife was separated from husband, or parent from child, vain was the hope of reunion. Each hurried blindly and confusedly on.

6. The groans of the dying were broken by wild shrieks of women's terror—now near, now distant—which, when heard in the utter darkness, were rendered doubly appalling by the crushing sense of helplessness and the uncertainty of the perils around.

7. Clear and distinct through all were the mighty and various noises from the Fatal Mountain: its rushing winds; its whirling torrents; and, from time to time, the burst and roar of some more fiery and fierce explosion.

8. Ever as the winds swept howling along the street, they bore sharp streams of burning dust, and such sickening and poisonous vapors as took away, for the instant, breath and consciousness, followed by a tingling sensation of ag′ōny, trembling through every nerve and fi′ber of the frame.

9. The sea had retired far from the shore; and the people who had fled to it had been so terrified by the agitation and preternat′ural shrinking of the element, the gasping forms of the uncouth sea-things which the waves had left upon the sand, and by the sound of the huge stones cast from the mountain into the deep, that

they had retired again to the land, as presenting the less frightful aspect of the two.

10. A wild yell burst through the air! Thinking only of escape, whither it knew not, the terrible tiger of the desert leaped among the throng and hurried through its parted streams. And so came the earthquake—and so darkness once more fell over the earth!

11. And meekly, softly, beautifully, dawned at last the light over the trembling deep!—the winds were sinking into rest—the foam died from the glowing azure of that now beautiful sea.

12. Around the east, thin mists caught gradually the rosy hues that her'alded the morning. Light was about to resume her reign.

13. Yet, still, dark and massive in the distance, lay the broken fragments of the destroying cloud, from which red streaks, burning dimlier and dimlier, betrayed the yet rolling fires of the mountain of the "Scorched Fields."

14. The white walls and gleaming columns that had adorned the lovely coasts were no more. Sullen and dull were the shores so lately crested by the cities of Herculaneum and Pompeii.

BULWER.

SIR EDWARD BULWER LYTTON was a celebrated English writer, born in 1805. He was also a Member of Parliament and Rector of the University of Glasgow.

III.

I. ABOUT BIRDS.

The EAGLE is a bird of prey—that is, it procures its food by violence or robbery, seizing not only other birds but also young fawns, raccoons, rabbits, wild turkeys, etc. Its height or length is about three feet. Some eagles have been known to live more than a hundred years.

2. The EAGLE is noted for its great strength and endurance, and it has been accepted as an emblem of the United States, also of Prussia, Austria, and other great nations.

3. Although eagles have been reported to be very fierce, and as having carried off young children, yet they have not always shown as much bravery and courage as some smaller birds.

4. The largest birds of flight is the CONDOR, which has its home in the **Andes Mountains.** It lives in the highest and loneliest places, and,

like the eagle, it is a bird of prey. Two of them, driven by hunger, do not hesitate to attack a horse, or a bull, or other large animal, which they tear to pieces with their strong, sharp beaks and talons (claws); and when they have killed it they so gorge themselves with its flesh that they are unable to fly. Men who wish to capture them take advantage of this greediness, and leave the dead body of a horse or other animal on the field until the condor has eaten so much as to become helpless. Its height is about four feet.

5. The OWL is remarkable for its large, round eyes, feathered ears, and fear of daylight. It flies about and seeks its food in the night-time, devouring mice, birds, moles, young rabbits, etc. It builds in caves, old walls, towers, etc. There are more than a hundred species.

6. The OSPREY, or FISH-HAWK, is said to be able to carry a fish of its own weight, but the eagle, when he sees the osprey carrying off a fish, pounces upon him, and, forcing him to let go, swoops down with wonderful swiftness, catching the falling fish before it can touch the water.

7. The birds of prey include the eagle, condor, vulture, falcon (*faw'kn*), hawk, and owl. Their

characteristics are strength, hooked bill, strong, sharp talons, fierce look, and keen scent.

8. The FALCON obtains its prey while it is flying. It is trained to capture other birds. Its home is in Europe and America.

9. Birds vary in size, from the huge condor, that has a body four feet long, and wings which sometimes spread out fourteen feet in width, to the little humming-bird, which is not much larger than a big beetle.

10. The HUMMING-BIRD is small and very beautiful. It is remarkable for its long bill, which reaches honey and insects inside of flowers, for its feathers of rich green, red, purple, and brown, and for the quick motions of its wings, which cause the humming sound. Like most other beautiful birds, they are more numerous in **Brazil** and other warm countries of **South America** than in the **United States.** There are about four hundred species of humming-birds.

11. There is a bird that knows how to sew, and is therefore called the tailor-bird. He sews leaves together and thus forms his nest. Others take long grass or any other fibrous material, and weave it into a kind of coarse cloth, of which

they make their nests.

12. We have one of these weaver-birds in our country. It is called the BALTIMORE ORIOLE, a beautiful bird covered with orange and black feathers.

13. His nest is not only strongly woven together, but kept from swaying too violently in the wind by cords that brace it in different directions.

14. Some birds are good plasterers, and fix their nests with mud or clay very neatly and securely in any favorable place. Some are so skilful as to made them adhere securely to the smooth surface of glass.

15. Our common CHIMNEY-SWALLOW is a very good plasterer.

16. There are other birds which may be called miners, for they dig holes in the earth and make their nests at the end of these holes.

17. Such are the SAND MARTINS, which dig in a dry sand-bank horizontal galleries, at the ends of which they have their comfortable nests. They fly about in small flocks, and seem to make very pleasant and sociable little communities.

18. The birds trained by the Chinese to

catch fish for their masters are called CORMORANTS.

19. Like the duck, goose, and swan, the cormorant has webbed feet and short legs. He is a very expert diver and swimmer, making use not only of his feet but also of his wings under the water.

20. The TOUCAN (*too'kan*) is remarkable for its large orange-red bill, which is more than half as long as its body.

21. The feathers of its back and wings are mostly black, and of its throat, white. It builds in the holes of trees, and feeds on small birds, reptiles, and insects.

22. Unlike eagles and condors, which live in pairs, the toucans live in flocks.

24. They are numerous in **Brazil** and other warm parts of South America.

24. The BIRD-OF-PARADISE, from which long, beautiful feathers of brilliant colors—green, yellow, red, and purple—are obtained for ladies' hats, is a native of the island of **Papua** (*pap'oo-a*), or **New Guinea.** It is found also on **Celebes** (*sel' e-bees*), the **Philippine** (*fil'ippin*), and other islands southeast of Asia. It is about as large as a pigeon, and feeds on seeds, grasshoppers, etc.

25. The rapidity with which birds can move through the air is astonishing. Few persons have any idea of the force expended in the action of flight.

26. Some birds fly so rapidly that the strokes of the wing cannot be counted. The wings of the humming-birds when in motion cannot even be seen.

27. Let any one try to count the strokes of the wing of a pigeon or of the diving sea-fowl, and he will find that it is utterly impossible.

28. Still more astonishing is the wonderful power possessed by some birds of finding their way through the pathless air, with no apparent means of guiding their course. This has been turned to account by man in the case of the Carrier-pigeons, which are used in carrying letters to distant places.

29. PIGEON-HAWKS must, of course, fly faster than pigeons so as to catch them, and they are sometimes trained for that purpose, so that the letters carried by the carrier-pigeons may come into the possession of those for whom they were not intended.

30. Some birds, on the other hand, cannot

fly at all. In this case their bones are as solid as ours. One of these, the OSTRICH, is the tallest of living birds, being sometimes eight to ten feet high, and weighing from fifty to one hundred pounds.

31. They furnish us with very beautiful feathers. These are so valuable that men have caught and tamed the ostriches, and you may now see in **South Africa** ostrich farms where these birds are reared.

32. There is an ostrich found in South America, but it is smaller than the African ostrich. It is called the RHEA. Its feathers are so much less beautiful that, in place of adorning the heads of our ladies, they are made into feather dusters.

33. Some eagles, hawks, and crows are so cunning as to have found out that a turtle or a clam, no matter how closely shut up, may be opened by being carried up high into the air and then let fall upon a rock.

34. Birds are very useful to us, not only for food and their beautiful feathers, but also for destroying insects which would do great damage to trees and plants. They also devour snakes, lizards, etc.

35. The WOODPECKER appears to have a hard life when compared with that of birds which easily find their food on the ground, in the water, or among the leaves of the trees; for the worms and insects upon which he lives are hidden away in the trunks of trees. To get them he must tear away the bark and perhaps bore or drill deep holes in the hard wood. This he does with his long, strong bill, much faster than any of you could do it with a sharp knife.

36. The PELICAN is remarkable for the great pouch or sack which is under its long bill and which serves as a kind of scoop-net. This pouch will hold fish sufficient for the dinner of six men.

37. Another excellent fisher is the HERON. It is remarkable for its long, curved neck, long bill, and long, straight legs, which are admirably adapted to its mode of life. Its feet are not webbed and, consequently, it is not a swimmer.

38. Another very tall bird similar in shape to the Heron is the RED FLAMINGO. It is a swimmer and wader. With its webbed feet it digs in the mud for worms, insects, and small fishes.

39. The WHITE STORK is also a long-legged

wader. It is noted for its intelligence and is very observing, readily judging of the feelings entertained toward it by the people on whose house-tops or chimney-tops it wishes to build its great, rough nest.

40. The KINGFISHER, like the Gull, pounces upon its prey at the surface of the water; but unlike it, it sits alone on a branch which overhangs the water, while the Gull and the Stormy Petrel skim rapidly and almost unceasingly over the water in search of their food.

41. The SNIPE, a much smaller bird than the Heron, has long legs and a long, slender bill, which are admirably adapted to procuring its food—insects and worms on coasts and marshes.

42. The QUAIL has a short bill and feeds on grain, seeds, berries and insects, which it finds on the ground. It flies low and only when startled lights upon trees.

II. A NOBLE BOY AND HIS FAITHFUL BIRD.

The island of Sardinia, situated in the Mediterranean Sea, contains mountains covered with

fine trees, amid which are pleasant homes surrounded by flowers.

2. Children play with rabbits and martins on the mountain-side, where vines leap from tree to tree, forming festoons and natual arbors, in which birds build their nests and sing their songs.

3. Rivulets dash, dance, and sparkle on their way to the little lakes, on whose shores the orange ripens and grapes of unsurpassed richness cluster. When Rome was the Mistress of the World, Sardinia was called her grăn′ary.

4. In 1654, the hero of our story was born on this lovely island. A bright, proud, dark-eyed boy he grew, the very idol of his parents. He rowed on the ti′ny lake, chased the moufflon on the mountain, and made the birds his friends. Two little sisters shared his love, and Francesco was a very happy boy, in a very happy home.

5. One night, when he was ten years old, he kissed his parents and went to his nice attic bed, and slept the sleep of a good boy to whom life has been all love and joy, with never a sorrow or care. Let us stop and look at that calm sleep: for so shall Francesco never sleep again!

6. The midnight was made hideous by that cry of "Fire! Fire! Fire!" and he awoke to see, by a glare of light, his mother at his bedside with a little girl in either arm. Through crashing timbers, smoke and flames they made their way out.

7. Those flames rose high and higher, grew hot and hotter—now rolling up as a scroll, now darting out in little tongues, and now sporting with each other in very wantonness of glee, while a huge column of smoke rolled up and shut out all the brightness of heaven. Fiercely the flames raged, fiercely the men fought them; and the father was foremost in the fight, until the dreadful fire leaped out and wrapped him in a death embrace.

8. The watching mother, with one loud shriek, fell. As friends clustered around to bring her back to conscious life, they saw that her feet were fearfully burned. In bringing out her children, she must have trodden on live coals, but in her anxiety, have forgotten herself.

9. The sun on the morning after that happy evening—that awful night—rose calm and bright. It shone on the few charred bones of the loving

father; on the prostrate mother, whose feet, swift to save her darlings, took then their last step; on the smouldering embers of the nice home; on three poor little homeless orphans. It shone with not one gleam of sympathy in a single ray, and its very warmth and brightness made it seem cold and dark, and chilled Francesco's young, aching heart.

10. For a time friends cared for the family; but little was saved from the wreck of property, and often they suffered with hunger, and the mother was compelled to send her son to tell her friends. A cold look, an indifferent tone, was worse than hunger to him, yet for his mother and sisters he would brave even a frown.

11. One night, as he lay on his hard bed, the moonlight shining through his little window, asking himself, as he had often done, "What can I do?"—a thought of the birds he used to pet came to him, and a smile played on his lips, though his eyes were blurred with his lone weeping, and great tears trembled on his long, dark eyelashes.

12. In the morning he brought in some bits of wood and began to whittle. An assurance of

coming independence was written all over his face, and he made the whole house cheery with the chirp of his musical whistle, and his mother, in her chair, rejoiced to see her boy so happy.

13. "These cups, mother, are for birds to drink out of; then I'll make some for seeds, and then some bath-tubs for them."

14. "Where are your birds, Franco?"

15. "The eggs for them are not laid yet! But they will be in the spring," he said, with a merry shout, "and I'll make the birds tame, and sell them, and buy you everything you need, mother!—It will be splendid, mother!" he added after a little; "I will get some willows and build a real bird-house."

16. "But your birds must be fed, Franco."

17. "I know it; I'll give them my dinner, and not care for myself."

18. The mother smiled sadly: for she did not know how much a boy can do when his heart and mind are at work with a will; but she would not dampen his pleasure by saying a discouraging word.

19. Instead of dying out, his thoughts kept growing—and thoughts do grow,—and he not only

tamed some birds, but he taught them little tricks, and they sold well.

20. Then his thought was very large: he would have an exhibition of tamed birds! He got some partridges—for those he found learned best—and trained them. Some he harnessed to a little brass cannon, and they would draw it across a table, while others would be armed with wooden swords, and all would march and wheel and form as Francesco beat on a ti'ny drum. Then all would stand still while one bird would fire off the cannon.

21. One bird was his special pet, and grew to be his firm friend and constant companion. It learned everything, and helped him to teach the other birds, and it seemed as if they knew what the partridge said to them.

22. It would scold, and even punish them, if they did not obey. But it was never content away from Franco. If he went to the woods or to the city, it would always go with him,—sometimes riding on his head, sometimes on his shoulder, and sometimes flying around him, so that "the young bird-tamer and his bird" were spoken of together.

23. But once his faithful partridge left him, —at a time, too, when he was feeling very sad, because a beautiful goldfinch he was taming for a lady had flown away, and he was almost discouraged.

24. On the fifth day, however, back came the goldfinch chased by the partridge, which settled on Franco's hand with the air of a conqueror and love of a faithful friend.

25. This noble boy fell sick. He wanted his birds, and they were let into his room; they hovered around his bed, rested on his pillow, and ate from his hand and sang to him. But the partridge would not eat or make a sound.

26. The moment came when the doctor said those sad words, "No hope." Not one moan rose for himself. But "*Who will take care of my mother —of my mother*—of—my—moth—er?" he moaned until the pale lips grew cold, and the bright eyes closed.

27. They put the birds back into the aviary, but the partridge could not be coaxed or driven from Francesco. They laid him in the coffin, and the partridge perched on it; they bore him to the churchyard and it flew over, and with an

eye fixed on that coffin, watched as they lowered it into the grave.

28. Night and day it stayed in that tree, going away sometimes for food, but returning to the same tree, from which it could not be coaxed.

29. Watching, waiting, mourning, the loving little bird-heart broke, and they laid it with tender hands and tearful eyes on the grave of him it had loved so well.

N. Y. Observer.

III. ABOUT QUADRUPEDS.

Millions of Cattle feed on the vast grassy plains of **Texas, Mexico,** and **South America.** Their value lies chiefly in their flesh, which is called beef; their hides, which are manufactured into leather; and their tallow, which is used in making soap and candles.

2. Cattle are numerous also in **Russia, India,** and our Western States and Territories.

What does the cow give us? What is made from milk? What is the flesh of calves called? *Veal.*

3. Leather is made from the hides and skins of cattle, horses, goats, sheep, deer, and buffalo. Its manufacture is one of the most important industries in the **United States** and **England.**

4. BUFFALOES were formerly found as far east as the State of **New York,** but now none are found east of the **Mississippi River,** and they are constantly diminishing in numbers.

5. Of all animals the DOG shows the greatest affection for his master, whose smile, or frown, or word, gives either pleasure or pain to this faithful companion of man.

6. Animals of the dog kind include the WOLF, which lives in a wild, savage state, and is always in search of plunder; the Fox, which is noted for its cunning, sly, and thieving disposition; and the JACKAL, of Asia and Africa, which, like the wolf, hunts in bands or packs.

7. Another very common animal is the CAT. Of this kind are the WILD CAT, LION, TIGER, LEOPARD, JAGUAR, PUMA, and LYNX.

8. The LION is called the "king of beasts," lives in Asia and Africa, and is noted for its powerful claws and great courage; the TIGER

inhabits the jungle grass of Southern Asia, has a striped body and a fierce disposition, and does not hesitate to attack even the elephant or man; the LEOPARD of Asia and Africa resembles the Tiger, except that its beautiful and valuable skin is spotted; the JAGUAR' or South American Tiger is spotted like the Leopard, and is strong enough to carry off a horse; the PUMA is called the American lion; the LYNX resembles the cat.

9. Animals of the dog and the cat kind are eaters of flesh, and are therefore called carnivorous. Animals which are tame and live in or near people's houses, are domestic animals; others are wild.

Is a dog a domestic, or wild animal? A lion? A tiger? A cat? A wolf? A leopard?

10. The animal which most resembles man is the GORILLA. Its head and arms are longer than those of a man. Its mouth is very projecting. Some Gorillas are nearly as tall as a man, but they are usually seen in a bent or crouching posture. The coarse hair which covers them is either gray or blackish. A full grown Gorilla is savage and powerful, being feared even by the lion. When about to attack an enemy, he stands

up, beats his breast, and gives a loud and terrific roar. His food is vegetables, sugar-cane, berries, and fruits.

11. The CHIMPANZEE, the BABOON, APE and ORANG-OUTANG are smaller than the Gorilla. The Gorilla and Chimpanzee have both been called "wild men of the woods."

12. The common MONKEY has a flat face and long tail; it is a great mimic, quite ingenious and very mischievous. There are many varieties of monkeys. Some seem to be constantly chattering, crying, jumping and swinging, while others are grave and silent. In some parts of India a light-colored monkey is considered sacred by the natives.

13. The ELEPHANT is the largest, strongest, and heaviest quadruped, or four-footed animal. His body is covered with a very thick hide, without hair. His legs are thick and clumsy.

14. He has a long trunk or nose, called a proboscis (*pro-bos′ sis*), which can lift a large or a small object, even as small as a pin.

15. His trunk is very powerful. It is his means of defence and offence; with it this enormous creature conveys food and water to his mouth, which is just under it and at its base. He

also draws water into his trunk, to wash himself with, which he does by blowing it out all over him.

16. His two long tusks of ivory project from the sides of his mouth; with these he digs in the ground for the roots and vegetables which constitute his principal food. He is also fond of sugar-cane.

17. The Elephant is brave and affectionate; he is also either grateful or revengeful, according as he is treated. He is fond of music. In India he has been taught to hunt the tiger, fight in battles, dance and perform tricks even on a tight-rope. Some elephants live to be one hundred years old.

18. Another very large animal, one that is much longer than the elephant, but not so high, is the HIP-PO-POT′A-MUS.

19. These animals are quite gentle, except when hungry; but if you could see their huge jaws open a distance of two feet in width, showing teeth a foot in length, you would be horrified, especially when you would see the immense quantities of vegetable foot they require.

20. The RHI-NOC′E-ROS is, like the hippo-

potamus, a very large, slow, stupid, amphibious animal. It is distinguished by its short, thick legs, heavy body, and large, curved horn at the end of its snout. Its hide is so hard, thick and folded that swords, spears, bullets, and the claws of the lion or the tiger have little or no effect. It is found in Africa, Asia, Java and Sumatra. The weight of a large rhinoceros is about three tons; of an elephant, five tons.

21. The BEAVER, also an amphibious animal, is remarkable for its activity, industry, and the wonderful instinct it possesses for building its house.

22. The MUSKRAT is something like the beaver in its size, form, habits and disposition for both animals live in companies in the winter, build houses for their families, and are hunted for their fur.

23. There is another very industrious little animal, which is like the beaver in laying up food for the coming winter, in the shape of nuts and acorns. Do any of you know its name? Yes, it is the SQUIRREL. It makes a funny appearance as it eats, using its paws for hands, and sitting up as you do at the dinner-table.

24. The FLYING SQUIRREL is provided with a strip of skin which it spreads out to enable it to sail or glide easily from a high to a low place among the trees. It cannot use this wing-like skin as birds do. It seldom ventures out till after sunset.

Besides the beaver, muskrat and squirrel, can you mention some other and better known little animals which are remakable for gnawing? *Rats and mice.*

25. The PORCUPINE which is about eighteen or twenty inches in length, also prefers the night for its movements. It is very active in searching for food, which consists of roots, fruit and bark. It is remarkable for being covered with sharp, strong quills, which it has the power of straightening out in all directions, when attacked, thus causing great damage to the mouth of any animal bold enough to take hold of it.

26. The CAMEL is the best fitted of all animals for traveling in desert places, because, first, it can take a week's supply of water in a peculiar arrangement of cells connected with the stomach, which can be supplied from them when the animal is thirsty; secondly, it can live on the scanty

herbage of the desert; thirdly, under each foot is a large cushion-shaped substance to prevent it from sinking in the sand.

27. The tallest animal in the world is the GIRAFFE (ji-raf′) or Ca-mel′o-pard, which belongs to the deserts of Africa.

28. It is especially remarkable for the great length of its neck and legs. In the absence of grass, this animal can make its food of the leaves of the trees. Its height is about eighteen feet.

29. There is a beautiful animal in Southern Africa which is about the size and shape of a pony, but has black and yellow stripes running around its body and legs. What is its name? The *Zebra.* ZEBRAS run wild in herds and are very difficult to tame.

30. The most useful animal to man is the HORSE, which is found in almost every country in the world where work is to be done. Arabia has long been celebrated for fine horses. The Arab loves and treats his horses as if they were his children.

31. There is an animal of the horse kind which is said to be the most obstinate and yet the most patient of all animals; what is it? The

DONKEY will, however, do more work for the smallest pay than any other animal, except, perhaps, the camel. Although much smaller than a horse, he will take you on long journeys and over dangerous places, and be content with a little grass or even a few weeds. Donkeys are very useful to the poor people of Africa, Asia and Europe.

32. Of all animals the slowest and laziest is said to be the SLOTH, which lives in South and Central America.

33. The animal which is remarkable for leaping or springing is the KANGAROO, of Australia.

34. A bear is more at home in a cold country and more comfortable in cold weather. The WHITE or POLAR BEAR lives among icebergs and feeds chiefly on fishes and seals.

35. White bears are fierce and strong; and like all other bears, have powerful paws and long, sharp claws with which they soon tear another animal or a man to pieces. Savage and dangerous as they are, the Esquimaux of the Arctic Regions hunt and capture them with dogs and sharp spears.

36. The flesh of these animals is used for

food, but their chief value lies in the long white furs. Perhaps some of you have seen such skins or robes in sleighs.

37. The common BLACK BEAR of North America and the BROWN BEAR of Europe are very much alike. They prefer the mountain districts. They are not so large nor so fierce as some other bears, but when attacked, they rise upon their hind feet and, if not promptly dispatched with the long knife or the bullet, the assailant is at once hugged to death with their powerful arms or torn to shreds by their sharp claws.

38. The most savage of all is the GRIZZLY BEAR, whose home is in the Rocky Mountain. Grizzly means somewhat gray.

39. Its strength and endurance are very great, for it has been known to kill and carry off a buffalo, to chase a man for long distances, capture and devour him. When overtaken by hunters, and after receiving several of their bullets, it makes desperate efforts to escape by running and swimming.

40. DEER are found in all parts of the world, —in cold, hot, and temperate regions; in forest, jungle, swamp and prairie,—except in Australia.

41. Deer are very timid. Whenever they discover an enemy they are off with the speed of a race-horse.

42. The most useful of these animals is the REINDEER, which is a domestic animal in parts of the Arctic regions, and constitutes the chief wealth of the Laplander of Northern Europe. His herds supply him with milk, flesh and materials for clothing, and some of these animals are trained to drag his sledge swiftly and for long distances over the frozen snow.

IV. THE BLIND MAN'S DOG.

About Christmas time after several hours of hard work I found on going out that the weather had become bitterly cold.

2. Running along the poorly-lighted road, leading to the city of London, I nearly stumbled against a man standing at the corner of the street; luckily the glitter of metal on his cap caught my eye, and looking at this I saw that it was a brass plate with the word "Blind" engraved on it.

3. He had with him a little dog which kept at his side, eagerly watching him; the dog was in the roadway while his master kept tapping the edge of pavement with his stick and intently listening for the sound of wheels.

4. At last the man said "Go;" and in an instant the little dog ran across the road, barking, as much as to say, Come on.

5. I was pleased to see that the two arrived quite safe at the other side. I at once entered into conversation with the blind man. I will now give you his history as he told it to me:—

6. "My name is James Stocks. I am seventy-eight years of age. I have been blind three years next April. My dog is as good to me as a pair of eyes. I call her 'Puss.' She is two years and a half old, and I gave two shillings for her to stranger. A blind man told the stranger to bring her to me, as he knew I wanted a 'guide-dog'. I had to train her myself. I took her to the safest place I knew, that is, by the side of a long wall.

7. "At first she would only lag behind me, but I took her out for half an hour every day, and in two or three weeks she learned to lead

me quite well. It took me longer to trust to the dog than it did for the dog to learn to lead me along, and now I can go anywhere with her.

8. "She knows her way as well as I do, and *I* have never been run over since I have had my Puss. I feed her on meat, and I give her an extra half-pennyworth whenever I can afford it. I cannot afford anything better for her, but she will eat cakes, almost anything that the children give her in the streets. She has had several pieces of plum-pudding given to her this Christmas time.

9. "I come out with her every morning from twelve to three, and at night from six to ten, and I stand here selling lead-pencils, and sometimes the people give me a few half-pence.

10. "When it's very cold I carry a little chair in a bag at my back, for Puss to sit down upon to keep her off the cold, wet ground. I also tie a little bit of carpet on her, as I feel a great deal for my little dog. I always carry a little water for her in a bottle in my pocket; I give it to her in a penny tin-mug, and, bless you, the little dog knows her bottle and tin-mug when I draw them out of my pocket.

11. "As I stand at my post, Puss sits by my side as quietly as possible; but when she sees any one looking at me she stands up on her hind legs, wags her tail, and asks for something for me. I can't keep her down; just you try her now, sir, and see if she will do it."

12. So I rose, and went toward the blind man. In an instant, Puss, which had been curled up at her master's feet, was upon her hind legs begging for him, while every now and then she gave a sharp yap, as much as to say, "Do give us something; we are both very poor."

BUCKLAND'S LOG-BOOK.

V. ADVENTURES IN AFRICA.

Emerging again into the broad sunlight, I strolled further in search of something to shoot. Presently, I saw, feeding quietly in the forest which bounded a valley on the left, a huge, reddish-colored wild boar, armed with most horrid tusks. Leaving Kalulu, my attendant, crouched down behind a tree, and my solar helmet behind another close by, that I might more safely stalk

the animal, I advanced toward him and after taking a deliberate aim fired.

2. As if nothing whatever had hurt him, the animal made furious bound, and then stood with his bristles erected and his tufted tail curved over the back—a most formidable brute in appearance.

3. While he was thus listening and searching the neighborhood with his keen, small eyes, I planted another shot in his chest. Instead of falling, however, as I expected, he charged furiously in the direction the bullet had come, and as he rushed past me, another ball was fired, which went right through him; but still he kept on, until, within six or seven yards from the trees behind which Kalulu was crouching, he suddenly halted, and then dropped.

4. As I was about to advance on him with my knife, he suddenly started up; his eyes had caught sight of the little boy Kalulu, and were then almost immediately afterward attracted by the sight of the snowy helmet.

5. These strange objects proved too much for the boar, for, with a terrible grunt, he darted into a thick brake from which it was impossible to oust him; and as it was getting late, and the

camp was about three miles away, I was reluctantly obliged to return without the meat.

6. On our way to camp we were accompanied by a large animal which persistently followed us on our left. It was too dark to see plainly, but a large form was visible. Late that night, we were startled by the roar of a lion, in close proximity to the camp.

HENRY M. STANLEY.

VI. A LION HUNT.

Soon after breakfast I took Khamisi and Kalulu with me for a hunt. After a long walk we arrived near a thin jungle, where I discovered the tracks of several animals—boar, antelope, elephant, rhinoc'eros, hippopot'amus, and an unusual number of imprints of the lion's paw.

2. Suddenly I heard Khamisi say, "Master, master! here is a 'simta' (lion);" and he came up to me trembling with excitement and fear, to point out the head of a beast, which could be seen just above the tall grass, looking steadily at us.

3. It immediately afterward bounded from side to side, but the grass was so high that it was impossible to tell exactly what it was.

4. Taking advantage of a tree in my front, I crept quietly onward, intending to rest the heavy rifle against it, as I was very weak from the effects of several fevers.

5. But my surprise was great when I cautiously laid it against the tree, and then directed its muzzle to the spot where I had seen him stand.

6. Looking further away, I saw the animal bound along at a great rate, and that it was a lion; the noble monarch of the forest was in full flight! From that moment I ceased to regard him as the "mightiest among the brutes."

HENRY M. STANLEY.

VII. THE KANGAROO.

I wonder if my young readers know the origin of the name kangaroo? When Captain Cook first discovered Australia he saw some natives on the shore, one of them holding a dead animal in his hand.

2. The captain sent a boat's crew ashore to purchase the animals, and finding, on receiving it, that it was beast quite new to him, he sent the boatswain back to ask the natives its name. "What do you call this animal?" said the sailor to the native. The native shook his head and answered, "Kan-ga-roo'," which means in Australian lingo, "I don't understand." When the sailor returned to the ship the captain said, "Well, and what's the name of the animal?" "Please sir, the black party says it's a 'Kangaroo.'" The beast has kept that name ever since.

VIII. ABOUT INSECTS.

INSECTS are everywhere about us. They are in great numbers and of great variety. They are in the air, in the water, and all over the Earth.

2. Those we know the best are the HOUSE-FLY, the BUTTERFLY, the MOSQUITO, the CATERPILLAR, the GRASSHOPPOR, and the BEETLE.

3. Besides these, there are thousands upon thousands so small that they cannot be seen with the naked eye. There is scarcely a leaf on a tree that is not the home of myriads of these little beings.

4. If you should look at a drop of water with the aid of a microscope, you would be amazed to see the number and variety of living creatures which it contains; some swimming like fish or eels, some jumping like frogs, and some dragging their bodies lazily along.

5. Just think of ten thousand (10,000) occupying the space of a grain of sand. Creatures which are so small as to be invisible, or nearly so, to the naked eye, are called An-i-mal'cules.

6. Insects are of many kinds; some have to creep about all their lives; some creep only for a little while, like the Caterpillar, and then undergo changes, taking to themselves beautiful wings.

7. The CATERPILLAR is the form which the insect takes just after leaving the egg; after a while it spins or makes for itself a kind of case or covering, called a cocoon: the insect is then called a Chrysalis. After remaining a while thus

enclosed, this cocoon bursts open, and out comes a beautiful Butterfly, changed from what was, only a short time before, a slow, crawling, and repulsive-looking Worm.

8. So, you see that the forms and changes of such Insects are—1st, the Egg; 2d, the Worm, Grub or Caterpillar; 3d, the Chrysalis; and 4th, the Butterfly, or perfect Insect.

9. Some kinds of Insects are very troublesome and often do great damage to trees and plants. You all know how soon one or two Caterpillars can eat up all the leaves of a little plant or bush in your garden, and that swarms of GRASSHOPPERS or LOCUSTS have in a few hours eaten up acres upon acres of growing corn, besides grass and vegetables.

10. The increase in the numbers of Insects is wonderfully rapid; indeed, if it were not for the multitudes of the busy birds whose food consists wholly or mainly of Insects, man might be unable to prevent the entire destruction of his orchards and his crops.

11. Great numbers of Insects are devoured by other Insects, and also by Toads, Frogs, and Ground Moles.

12. You must not think, however, that all Insects, Caterpillars and Butterflies are our enemies, for there are some kinds that are consantly at work for us.

13. All the beautiful silk dresses, handkerchiefs and ribbons are made from the material which formed the case or cocoon of a Caterpillar, called the SILKWORM.

14. HONEY-BEES are of three kinds: the Queens, the Working-bees, and the Drones.

15. The QUEEN-BEE is the ruler of the hive—and the mother of all the young Bees in it.

16. The WORKERS are very intelligent and industrious. They form themselves into companies. One division or company roams the fields and gardens in search of food; another builds the cells; another helps those which come back with heavy loads, or feed and nurse the young Bees. All make the most of their time, and of every inch of room, for their house answers both as nursery and storehouse. There are also house-cleaners, sentinels and fighters. Even in a single day they have been known to make 4,000 cells.

17. ANTS resemble Bees in their habits of

order and industry, and in being divided into three kinds, Males, Females, and Workers.

18. The ANT WORKERS have charge of the eggs, cocoons, and young Ants, as well as of the house affairs.

19. The COMMON ANTS are the Red and the Black; some have wings, others have none.

20. Ants of the same family or kind live together in great harmony, and are never weary of helping each other. If one is tired or sick, another will take him upon his back and tenderly carry him.

21. Ants come forth in myriads about the first of April. Four or five months of the year that the Ant is supposed to live, some kinds spend in a torpid state.

22. The GRASSHOPPER is of the same order of Insects as the Locust, Cricket and Katydid, having long bodies, four wings, and three pairs of legs. Their food is grass and the leaves of plants.

23. Grasshoppers are of great variety; some are green, some black, and some variegated. Some make a chirping sound and some are always silent.

24. LOCUSTS are the most destructive of this

kind of Insects. They fly in vast numbers, like clouds which hide the sun, and come down on the growing crops of spring as fast and as numberless as snowflakes in a winter's storm.

25. The "SEVENTEEN-YEAR LOCUST" (more correctly called HARVEST FLY) has a thicker body and shorter legs than the Locust or the Grasshopper. It flies, but does not leap.

26. CRICKETS belong to the same order of Insects as the Locusts and Grasshoppers. They can dig underground passages for themselves, and their long hind legs enable them to take long leaps.

27. One of the most annoying Insects is the MOSQUITO, which has a long, slender body, six legs, and two wings. It has also a little proboscis for piercing and sucking. This contains several lancets so small and so sharp that together they are finer and sharper than a needle.

28. The DRAGON FLY has a long, slender body and four long, narrow wings.

29. Its thin, crisp wings are as clear as glass, reflecting all the colors of the rainbow, and seem to be in rapid and almost constant motion. While flying, it catches multitudes of Mosquitoes,

Gnats, Beetles, Flies, and other Insects.

30. They are therefore beneficial, and not in the least injurious to man or child (although it bears, in some places, the frightful name of "Devil's Darning Needle").

31. Butterflies, like other Insects which fly, have two long, slender horns or feelers, which they can turn in every direction.

32. The Caterpillar eats enormously, grows rapidly, and often changes its skin.

33. Butterflies generally live but one season, although some live through the winter.

34. The House Fly has two wings, six legs, a sucking proboscis for taking its food, and two great eyes which are composed of 4,000 small eyes.

IX. BRUCE AND THE SPIDER.

For Scotland's and for freedom's right,
  The Bruce his part had played
In five successive fields of fight,
  Been conquered and dismayed;
Once more against the English host

His band he led, and once more lost
  The meed for which he fought;
And now from battle, faint and worn,
The homeless fugitive forlorn
  A hut's lone shelter sought.

And cheerless was that resting-place
  For him who claimed a throne:
His canopy, devoid of grace,
  The rude, rough beams alone;
The heather couch his only bed,—
Yet well I wean had slumber fled
  From couch of eider-down!
Through darksome night till dawn of day
Absorbed in wakeful thought he lay
  Of Scotland and her crown.

The sun rose brightly, and its gleam
  Fell on that hapless bed,
And tinged with light each shapeless beam
  Which roofed the lowly shed;
When, looking up with wistful eye
The Bruce beheld a spider try
  His filmy thread to fling
From beam to beam of that rude cot;

And well the insect's toilsome lot
Taught Scotland's future king.

Six times his gossamery thread
The wary spider threw;
In vain the filmy line was sped,
For powerless or untrue
Each aim appeared, and back recoiled
The patient insect, six times foiled,
And yet unconquered still;
And soon the Bruce, with eager eye,
Saw him prepare once more to try
His courage, strength, and skill.

One effort more, his seventh and last!
The hero hailed the sign!
And on the wished-for beam hung fast
That slender, silken line;
Slight as it was, his spirit caught
The more than omen, for his thought
The lesson well could trace,
Which even "he who runs may read,"
That Perseverance gains its meed,
And Patience wins the race.

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（明治三十六年一月調）

既刊英文叢書目次

第一編 改訂 ディッケンス抄

ホーガーズ夫人に與ふる文其他十六編の書翰とお隣りの人等數種の短篇と及びクリスマスカロルの拔萃とを配合せり

第二編 撰訂 米國三名家抄

アーヴィングの肥滿紳士等數種の短篇とウェブスターの紀念碑演說とホーソーンの新葉兩年等數種の短篇を配合せり

第三編 撰訂 少年用物語抄

アスコットホープの教訓小話盜賊遊戲とウィルヘルムハウフのお伽話二篇とデーが少年デックの生立ちとを配合せり

第四編 改訂 近世三冒險譚

コッチレーンの筆になる僅々二十年前の北極探險及北東通路發見の記事とイーカウングが火急事の拔萃とを配合せり

第五編 改訂 ヂェローム、クー、ヂェローム抄

行文流暢機智加須英國現文壇無双の滑稽作家と喧傳せらるる氏の短篇三人乘及小説創作相談を撰訂改作せしものなり

第六編 改訂 マークトウェーン抄

米國現文壇無双の滑稽作家たる氏の變手古な夢等數種の短篇と停車場の朝食等數種の拔萃と及び一長篇とを配合せり

第七編 撰訂 少年學校物語抄

ホープ等五作家の短篇小話を蒐む彼國學校の光景活躍たると共に本邦學生亦鏡に對して自己の姸醜を寫すの想ひあり

第八編 撰訂 少年氣質物語抄

四洋の少年を描出せんが爲めにドーデー等七作家の氣質物語八篇を撰擧せり本邦の少年之を讀みて感興殊に深からん

第九編 撰訂 少年海陸冒險譚

能く少年の興味を惹起して不知不識其讀書心を旺盛ならしむるもの蓋し冒險譚を第一となす所收十一篇要は茲に在り

第十編 撰訂 少女家庭及學校物語抄

泰西少女の學校及家庭の狀況を描出せんが爲めにクーリッヂ等作九篇の語物類を蒐む希くば本邦少女の好伴侶たらんか

第十一編 撰訂 少女用物語抄

モリソン等九家の作各一篇宛を撰む料理競べの家庭物語あり光線乘りの伽話あり幽靈かの學校物語あり案配尤も妙

第十二編 改訂 通俗科學讀本抄

前植讀及地文の四科を三學期に案配したるもの也文字通俗卑近にして解し易く最も中學程度の科學熟を圖するに足る

第十三編 以下近刊

文學博士 南條文雄校閲
文學士 加藤玄智撰

教科適用 英文東洋學名家詩文抄

Extracts From the Works of Eminent Orientalists

全二冊 定價各冊 金貳拾貳錢

邦人が英語を學修するの困難なる一は其の章句文辭の新奇なるに由るべしと雖も一は又書中記する所の思想觀念の全く外國的にして從來之れと毫も親み無きに坐せずんばあらず加藤文學士夙にこれを憂へ思想材料を一に邦人の豫め聞き慣れたる東洋に於ける人文史上の事實に採り是等材料の下に歐米諸大家のものせる詩文を輯めて以て本書を成せり本書の原作は輓近印度支那日本等の東洋諸學に精通せるマクスミユラー。エドウキン。アーノルド。リス、デキツス。モンエル。サリアムス。サミユーエル。ビール。アーサー。リリー。ポール、クーラス。グリフィス等の彩筆に成れる名篇にして最も教科用書に適する様其の英を撰び筆を鍾めて抜抄し更に南條博士の精確なる校閲を經たる上に卷尾には一々日英兩語に由つて難解の文字に註釋を施し以て參考に供せり

中學及中學以上の學校特に佛教の中學高等學校大學其他佛教青年講習會等の講本として最適當なる教科書たるを信ず

山口縣萩中學校教諭　井上要二著

Everyday English in the Class-Room

全一冊　定價金拾八錢

英語會話に熟するに最も適當なる方法は他人に對し不都合なく生意氣なる嫌なき限りは成るべく英語を用ゐるに在り著者常に此の主義に據り多年經驗に問ひたる結果先づ教室内に於ける日常の會話を蒐集し編を分ちて(第一)授業の始(第二)窓及び窓掛布(第三)教科書其他(第四)復習(第五)注意(第六)其日の課業(第七)授業の終の七篇とし更に附錄として(第一)單語集(第二)格言集の二篇を添へ且つ卷尾に白紙を附して自ら必要なる用語を書き入るゝの便を圖りたるもの本書即ち是なり苟も英語を學ぶものの爲には必携の良種珍書たること疑を容れざるべし

ヘラルド新聞主筆　トーマス、サツチエル校閲
ヘラルド新聞記者(飜譯主任)　梅澤壽郎著述

How to Paraphrase

全一冊　定價金貳拾七錢

英文には自ら一定の解釋法を有すること勿論なるに從來邦人の爲に其方法を說示したるものなきは英文界の大缺陷と謂ふべきか著者多年海外に留學して實地に研鑽し嘗嘗ヤマトヘラルド新聞に於て飜譯を擔任し頗る此缺陷に就き憂慮する所ありて本書を作れり

本書は卷首に例言數十則を揭げ英文は如何に解釋すべきかの方針を詳說し次に歐米諸文豪の著名なる文章數十篇を把りて(第一)全章の大意(第二)各節の意義(第三)解釋文の三項を設けて縱橫無盡に解釋を與へたれば英文を學修する者の爲に麻姑を倩うて痒きを搔くの感あるべく隨つて作文に講讀に良師益友たること信じて疑はざる所なり