# THE NATURAL SYSTEM OF TEACHING GEOGRAPHY.

W. H. H. BEADLE, A. M.

AND

A. F. BARTLETT, A. M.

CHICAGO,
A. FLANAGAN,
PUBLISHER.

# THE NATURAL SYSTEM OF TEACHING GEOGRAPHY

W. H. H. BEADLE, A.M.,
*Pres. Madison State Normal School of South Dakota,*

AND

A. F. BARTLETT, A.M.

CHICAGO:
A. FLANAGAN, PUBLISHER.

# TO THE TEACHER.

The central idea and aim of the system taught in this book is to impress upon the pupil's mind a *picture of the world, definite and clear*. This is accomplished through the learning of maps, not by looking at them and finding answers to printed questions, but by the repeated drawing of them; first the easier continental forms, but mainly by repeatedly drawing *all* of them *in the hemisphere*, and successively adding mountains, rivers, gulfs, bays, lakes, islands, cities, boundary lines of countries and smaller details. The work is continued until the pupil is able readily to draw from memory the map of either hemisphere, on *any* scale, and to locate correctly all facts and places of importance, and to enter in place the names of the products, the character of the people's civilization and the names of the persons especially distinguished in each country. In addition the pupil is to be trained to take any particular country or state, his own especially, and magnify its map by a larger scale and fill it with greater detail. He is also to be trained to draw cross sections of continents and countries and give with each the principal elevations and indicate the great valleys, plains, slopes and plateaus, also the lakes with their surface elevations and depths, using the sea level as the *datum* line for all.

When the astronomer photographs a section of the starry sky and his instrument is directed steadily by clock-work upon it, the sensitive plate will first show the brightest stars, then those of lower and lower magnitude, until finally it will picture remote stars and nebulae which are hardly visible to the eye through the best telescope. Whether the brightest or the smallest, all these will be printed in the right relation to one another. So the child begins with the simpler and easier continental forms, as separate objects to be drawn (perhaps by the aid of card-forms made for him, as a part of his "form work" or drawing). Then with the hemisphere maps he adds steadily the facts and places, with their names, until he has a mental picture of the earth's surface with all the features before mentioned, and all in approximately correct relations of area, direction and distance. He will thus learn geography more fully and correctly and in briefer time than is otherwise possible. Then correlation of history and other subjects with geography becomes easy. As he studies the relations of man and nature, about history and literature, campaigns and discoveries, or reads the current events of the world, his mental picture, always rising for his use, locates the facts instantly, correctly and *naturally*. His interest is quickened in all other subjects. He has a basis for sound general intelligence; for history, literature and all the developments and changes, politically and socially, that make the progress of the world of such increasing interest.

The system and the book are planned primarily for the successive grades and classes of our public schools, but the skilled teacher easily adapts them to the needs of normal school and academy classes when the whole subject of geography is taken up anew and completed in a half year. After the introductory work upon mathematical geography the hemisphere is drawn with the simpler continental forms. Then daily, upon paper and the black-board, the work goes on in mapping along with the subject matter study. As all the time saved from memorizing map questions is given to the hemisphere map drawing the whole work is accomplished much more thoroughly and completely in the same time as has been shown every half year since the introduction of the system. Where the method is first introduced a like course is useful with the higher classes or grades in the public schools. It is practical and time-saving under every reasonable condition.

W. H. H. B.

"4. The economy of time and energy: The pupil not only acquires more in much shorter time and easier, but retains most of what he learns, instead of forgetting most of it, as is usually the case.

"5. The increasing interest which the pupil takes in the study. The constant development and growth of the world-picture in his hand fascinate him, and geography becomes the most popular study.

* * * * * * * * * * * *

"This method is not to be confounded with map drawing as usually understood. The aim here is to secure a *world-picture*, and not that of an isolated continent or country."

In introducing any new method it has been found generally that explanations and directions to the teacher alone, however full and explicit, will not insure success. It is especially true of this system. The work must be definitely mapped out and graded *for the pupil*, as well as for the teacher, and the pupil must have before him correct models from which to copy his maps.

It has, therefore, been the aim of the authors and the publishers to put this book in substantial and economical form, so that it may be placed in the hands of pupils as well as teachers, and be used *in conjunction with* and not in place of the regular text-book in geography.

The teacher is often tempted when presenting or using this method for the first time, to try "short cuts" and "better ways" than those suggested, with the great risk of wasting valuable time, and not unlikely ending in confusion and partial failure. Let us, therefore, caution all to follow the instructions exactly as given. When the system has been mastered, excellent results will be secured certainly and quickly. Only then, if at all, may it be safe to experiment.

The outline of work for each grade has been given in full, and is, in the main, quite in harmony with the most advanced thought and best methods of today. In addition to this, and to guard against every possibility of failure, instructions to teachers have been inserted throughout the book, where there seemed to be any need of it, even at the risk of being charged with much repetition.

Some supplementary matter, treating subjects of interest, and usually more fully than is done in the common texts, is appended, without much reference to logical sequence or completeness in number of topics, which may serve as supplementary reading for the pupils as well as lessons for study. The articles, "A Trip to Greenland," by the eminent scientist and author, Professor G. F. Wright, and "A View of Europe," by Fanny E. Coe, the author of those admirable readers, "Our American Neighbors" and "Modern Europe," were written especially for this book, and well illustrate the authors' idea of one of the best methods of giving children vivid impressions of other lands, climates, products, people, etc. The teacher should try to give clear, living pictures of other regions and countries by similar means. Pupils may be encouraged to read articles of like character found in books and magazines on "The Hot Regions," "The Islands of the Sea," stories about the United States, South America, Asia, Africa, etc. A list of books suitable for such supplementary reading and adapted to the different grades, also a list of books for reference and instruction of teachers are given. These are not exhaustive, as excellent works of this character are constantly appearing.

The chapter on Commerce will prove useful to advanced pupils for reference and study, as it contains much valuable and interesting information in regard to important products not readily found elsewhere.

Our grateful acknowledgments are due the many teachers who have aided in the work by their suggestions and criticisms, and especially to Sanford Niles and Professor G. F. Wright for valuable assistance.

W. H. H. B.
A. F. B.

# PREFACE.

This book is intended as a supplement to the regular text-book in geography, and not in any sense as a substitute for it.

The system of teaching geography here presented is not a theory merely, but a practical method, every detail of which has been carefully worked out and tested in the school room. The idea was first suggested to the authors by the generally unsatisfactory results secured from teaching the subject in the usual way, and which were only partially remedied by the many improved texts that were issued. The time and energy expended by both teacher and pupil seemed to them to be out of reasonable proportion to the results secured. Of the great mass of matter studied but little was retained, and there was always more or less confusion in the mind of the pupil in regard to those prime essentials of geographical knowledge,—form, comparative size, drainage, relative position, climate, products, etc.

In the words of that experienced and able critic, Sanford Niles, * who fully investigated the system in the school room:—

"It [the system], is based upon the truth of the following propositions:

"1. The foundation essentials of geographical knowledge, as form, position, comparative size, relation, are best acquired from a map, and, however learned, are always remembered by means of a mental map-picture.

"2. This mental picture is rendered more definite and permanent by use of the hand in forming it.

"3. By copying a picture until it can be reproduced readily in absence of the original, a mass of details as to form, size, and relation of parts is mechanically acquired that would be absolutely beyond the power of the memory to retain, or even grasp from description alone. The memory is thus actually relieved of burden.

"4. Correct notions of the parts in relation to themselves and the whole can only be obtained from a view of the whole. The picture should be drawn as a whole, to give correct notions of relations of parts.

"The fact that the first primary child, soon after entering school, writes sentences in script without knowing a letter, suggested that drawing simple outline maps is not beyond the capability of children of the lower grades. *The chief object of the method is to get a picture of the world, as shown by the hemisphere maps, indelibly impressed on the mind of the pupil.* This is accomplished by requiring him to draw outline maps of the hemispheres, adding details gradually and in order of importance. Care is taken to draw all maps of separate countries on the same projection, so they will fit in the hemisphere, and on the same scale where two or more maps are drawn at the same time. Thus, correct notions of form, size, etc., are always kept before the mind of the pupil.

* * * * * * * * * * * *

"All this is done according to a natural order of sequence. Each step is fully developed and made clear to the pupil as taken up. The simple outline maps gradually grow in excellence and completeness under his hand, while his imagination, guided by definite knowledge, builds them into a great and beautiful world, teeming with animal and vegetable life — all contributing to the welfare of man.

* * * * * * * * * * * *

"Some of the points which especially commend it are:

"1. The definite mental picture it gives of the world as a whole, and its parts in their true relations — an end we strive in vain to reach by usual methods.

"2. The saving to the memory which this picture gives, and the opportunity it furnishes for exercising the powers of reason and imagination. The world-picture springs into the mind without effort. The child *sees the picture, and thinks the relations.* It enables him to journey about the world with ease and delight.

"3. The superior results, both in quality and quantity, as may be inferred from the preceding.

(*In N. Y. School Journal of June 11, 1898.)

# CONTENTS.

# INSTRUCTIONS TO TEACHERS,

## AND OUTLINE OF WORK.

Before attempting to give instruction in geography according to this method, even in the lowest grades, the teacher should make herself familiar with the whole system, and especially by practice with the map drawing. She should read carefully and understandingly the outline of work so as to get a clear notion of the philosophy and plan. Much study outside of the text-book is necessary for the best work, especially in the higher grades. Geography is the broadest study taught in our schools, and is one of the most useful. It should be the most interesting to pupils. In order to make it so the teacher must be thoroughly interested in it herself and full of the subject. She should read as many books bearing on geography as possible, so as to have a stock of stories and interesting and useful matter to draw from as occasion requires. The black-board and crayon should be freely used in illustrating things talked about. Every lesson should be carefully planned and prepared by the teacher in advance.

No other branch offers such an opportunity for Nature Study and Language Work. Much should be made of it.

This book is intended to give a method of teaching geography and *supplement* the regular text-book in geography—not to take the place of it.

For the guide of the teacher, the work for the first few years is mapped out somewhat in detail.

## FIRST AND SECOND YEARS.

### Relative Position as Expressed by the Terms, Over, Under, Above, Below, In, On, Upon, Before, Between, Behind, Front, Back, Up, Down, Right, Left, Center, Corner, Middle, Etc.

Place objects and have pupils imitate; place, and have pupils describe position; dictate, and have pupils place; place several objects, remove, and have pupils replace from memory.

### Direction of Places from Self and from One Another.

Begin with directions in the school room; then, at convenient times, walk with the class on the school grounds, asking questions like the following:

What direction are we from the school house? What direction is the school house from us? What direction is the bird flying? Which way are we going? Which way does the weather vane point? Is this an east-and-west, or a north-and-south road? From which way does the wind come? In what direction does the brook flow?

### Plants and Animals—Language Work.

Teach the pupils to distinguish the colors of flowers, fruit, foliage, etc.; to name plants that grow in the house, in the garden, in cultivated fields; to name trees and shrubs that grow in yards and orchards; and a few of the common trees of the forest. Talk with pupils about the homes of ants, of bees, of hornets, of wasps and of other insects; creatures that burrow in the earth, such as the mole, the woodchuck and the gopher; of the partridge and the way he drums. Have the pupils tell where the common birds build their nests; how they feed their young; what food they eat; etc. Talk about the squirrels that live in the trees, the dog, the cow, the sheep, and other domestic animals, how they serve man, and above all, tell or read stories of animals, breathing a spirit of kindness toward all our friends in feathers and furs. Encourage pupils to talk about these things, and language will be made to go hand in hand with geography.

### Stories About People in Far-Off Lands.

Tell or read stories of the people of other lands—the Eskimo, the Arab of the desert, the Negroes of Africa, the Nomads of Central Asia; the homes they live in; their clothes; their food; what they do; the animals they use.

The friends of many of the children once lived in lands beyond the sea. Have children tell what they have heard about these lands and about journeys across the sea.

### Different Modes of Traveling.

Relate stories about caravans crossing the great deserts; of reindeer and sledges speeding over the snow; of dogs drawing their masters on fields of ice; of mule trains slowly climbing the narrow mountain paths; of trappers and hunters paddling along lonely streams. Use pictures at every step.

### The Air or Atmosphere.

Tell pupils that air is all around, over land and water; that plants and animals and people would die without it; that the tiny drops of water in the clothes hung out to dry, in the moist earth, in puddles, etc., are all the time being taken up into the air; that clouds are but moisture or tiny water drops, gathered and floating high in the air. The air rushes into the stove and it roars. We say the stove draws. The air is rushing and roaring out of doors. We say the wind is blowing. The air is in motion.

### The Sun, Moon and Stars

Are all far, far away from the earth. The sun gives us light and heat. We could not live without it. There could be neither plants nor animals without light and warmth from the sun.

### Days of the Week, Months of the Year, Seasons.

#### Distance as Expressed by the Indefinite Terms, Near, Far, Nearer, Farther, etc.; and by the Definite Terms, Inch, Foot, Yard, Rod, and Mile.

Have pupils point out objects that are near, nearer, farther, etc. Provide a foot rule, a yard stick, a pole or string one rod long, and show pupils how to use them, by measuring the length, the width and the height of a few prominent objects. Have pupils hold their hands one foot apart; stand one yard apart; stand one rod apart; etc. Point out objects one mile away. Tell how far it is to the church, the mill.

### Map and Form Work.

The last part of second year, pupils may profitably trace, as part of busy work, from cardboard forms, outlines of South America, North America, and, later, of Africa and Australia. These cardboard forms should be on the same scale, accurate, and taken up in the order named. Correct names should always be given. Pupils should be finally encouraged to *draw* the outlines by just looking at the forms and occasionally from memory.

---

## THIRD YEAR.

### Occupations of People All About Us and Far Away.

Pupils should be encouraged to visit farms, market-gardens, shops, mills, quarries, mines, foundries and factories in company with parents or older brothers or sisters, in order to gain clear ideas of the different occupations by which men live. Talk about these occupations and the things we buy at the store, the grocery, the lumber yard, etc., and lead children to tell what people in the other parts of the world must be doing.

### Commerce or Trade.

Ask pupils to name the things their parents raise or make to send abroad. What things do we receive from people far away? What things do we send to people over the sea? What things come to us from over the sea? How do we send what we have to sell? How are things brought to us? (Transportation.)

## Forms of Land and Water.

Most pupils have seen and are already familiar with the common forms of land and water, and they also know their names. They should now learn the parts of the hill and mountain—base, slopes, summit, peak; the parts of the stream—source, channel, right bank, left bank, mouth; the parts of the shore or coast—cape, promontory, peninsula, isthmus, etc.; and other geographical terms.

The streams formed by melting snow or summer showers form opportunities for many valuable lessons. The rill itself is a river in miniature; the tinier streams flowing into it are its tributaries; the pools from which some of the streamlets flow, are lakes, with inlets, outlets, bays, or gulfs. There are rapids and cataracts, with stretches of still, navigable water for the boy's little boat, and there is an estuary opening into a large pool which will do fairly well for a sea. The rill with its tributaries represents a river system.

The slope down which the rill flows, is a watershed; the land drained by the rill is its valley. Islands are seen here and there. In places where the ground is hard and the slope steep, the rill has cut deep into the soil, forming narrow valleys, gorges or canons; and where the ground is soft or sandy and the slope gentle, it has formed a wide valley. There are shoals, bars, and alluvial plains formed of black earth, sand and gravel brought down by the rushing waters. The shores of the tiny lakes have their capes, their promontories and their peninsulas. Notice how the rapid little stream carries down straws, sticks, and even pebbles, undermines the homes of the beetle and other small animals, and sweeps them along with it, just as the larger floods carry great logs, roll large boulders, and destroy the homes of men.

The streams formed by the summer showers also show in a striking manner how the surface of the earth is being changed by the action of running water. Right before our eyes hills are being worn down, valleys furrowed out, plains extended, islands formed, coast lines changed, and deltas built up. In places, layers of soil, of clay, of sand, of gravel or hard-pan are exposed, and we get a glimpse of the structure of the earth near its surface.

In our rambles with the children by the banks of these tiny brooks, we observe that the seeds of the trees, of plants sown in the fields or gardens, of grasses and noxious weeds, are swept along by the flood and left here and there on the lands below. Later in the season we see miniature groves, patches of grain, grass or weeds, as the result of this sowing—a wonderful lesson of wide application on the distribution of plants.

## Maps and Map Reading.

Pupils should be now given a clear idea of a map and how to read it. Begin with a plan or map of the school room, indicating the position of the desks, etc.

Next represent the school yard; a country road with farmhouses, groves, gardens, and fields on either side. Teach pupils to draw to a scale—to different scales, commencing with the school room. Locate prominent objects in the neighborhood of the school house, give their direction and approximate distances from the school and from one another. Then draw a map of the neighborhood and require pupils to state direction, position, etc., from that. Finally draw a map of the county, when of convenient form. This map should be quite complete, representing streams, bodies of water, hills or mountains, and some of the principal common roads, railroads and towns. In their own language, pupils should state where objects are situated (relative position), direction, approximate distances, etc.; slopes, as determined by hills and streams.

## THE EARTH AS A BALL OR SPHERE.

As an introduction "The Story of the Earth" may be read to pupils by the teacher, first as a whole and then taken up in sections from day to day and each point explained and made clear. After this the pupils should be required to read the story themselves in class and tell about it in their own language, and write about it.

Give children an idea of the earth as a ball, like the moon, only very much larger; or like Venus, which is another earth, but so far away that it appears very small. Speak of the surface of the earth as composed of land and water. Using a globe, point out and name the great bodies of land and water; show pupils where they live.

To give an idea of the great size of the earth, imagine a railroad track to be laid around it over the land and over the water. The earth is so large, it would take a train fifty days, or more than seven weeks, to run around it at the rate of five hundred miles a day. The earth appears flat to us because we see so small a part of it at once. A fly on an open umbrella would see so little of its surface that the umbrella might seem to it as flat as the top of a table.

Take journeys around the globe, and have pupils tell whether they are crossing land or water. Show that one comes back to the place of starting by going always in the same direction. With a string have pupils measure the distance around the globe (circumference). Have them think of the distance from surface to surface through the center of the globe (diameter). Rotate the globe and give idea of axis, and of the poles or ends of the axis. Locate the equator midway between the poles.

Keep in mind the idea that the artificial globe represents the form of the earth; that the map on its surface represents the real land and water of the earth on which we live, just as the maps they have drawn represent things all about us.

Hold the globe in the sunlight and lead pupils to see that one-half of its surface is always touched by the sun's rays; that the opposite half is in the shade. Tell them that the lighted side of the globe has day, and the shaded side night. Then have them state whether it is day or night where they live. Slowly rotate the globe from west over to the east, and have them tell when North America has day, when night, leading them to see that the succession of day and night is caused by the rotation of the earth about its axis.

One pupil may represent the sun while another pupil carries the globe round him, rotating it all the time. The time of one rotation of the globe will represent the length of the day; the time of one journey around the sun (revolution) will represent the length of the year.

Using the globe, show where the hot, cold, temperate regions of the earth are, and require pupils to find out the names of some of the animals and plants found in them. Talk of the different people and races of the earth, and how they live. Later have the pupils indicate the homes of the different races on their maps.

Have pupils learn the names of the capital of their own state and two or three other important towns, as well as two or three of the leading occupations of the people.

The simplest language of the text book, the plainest speech of the teacher, cannot be understood unless the types of the things spoken of are already in the mind of the child.

For this reason we begin with local geography. One's own neighborhood is a part of the earth's surface. The hill near the school is the type of the unseen mountain; the brook where the children play, a type of the river; the pond, a type of the great lakes or of the sea; the little plain or the prairie near at hand, a type of the vast llanos, pampas, or steppes in far-off lands, and so on through the whole list of natural features and of other things right about us.

To be really successful the teacher herself must have clear mental pictures—must see what she desires her class to see. She must make frequent appeals to the imagination, always active in childhood, aiding its flight by the use of pictures and familiar types of things. To give pupils an idea of a mountain she must make the hill many times larger—broaden its base, make its summit pierce the low clouds, place on it a cap of snow, clothe its rocky slopes with trees growing smaller and smaller and changing in kind with the elevation.

A sand pit or a dusty road, extended farther than one can see in all directions, may serve as a desert; put in the desert a spring with a few palm trees, and you have an oasis.

The pond is a small lake; if spread out to the right, to the left and in front to the horizon, it will resemble a large lake or the ocean itself.

The brook is a miniature river; make it wide and deep and long, and pupils will have an idea of a river.

A little ravine between the hills, magnified greatly, becomes a valley between mountain ranges.

The warm weather, vegetation and fruit of summer suggest the tropics, and the snow and ice of winter with the long nights and absence of vegetable life represent well the regions of cold. When teaching geography to beginners bring the huge trees of the Pacific states right before the class. Have a circle drawn to represent their diameter. Think of a tree as lying on the ground and extending across the school lot and far into the neighboring field; of the prone trunk as being higher than two school rooms, one above the other; of a plank cut from it as being wider than the school room.

Think of the Niagara river above the falls as being as broad as the distance from the school house to a certain object; of the mass of water as leaping over a precipice four times as high as the tall tree in the yard, or three times as high as the spire of the church.

Thus assist the imagination of the pupil to get vivid conceptions of things unseen.

## Map Drawing.

The pupil should be required from the beginning of this year to draw a map each day, first copying it from the cardboard form, then from the outline maps given in this book, and in the order given, and finally from memory. The memory map should be corrected immediately by comparison with the original. The purpose is to get the *form* fixed in the mind as early as possible. South America is simplest to draw and is therefore taken up first, then North America. After fair proficiency has been acquired in drawing these they should be put in a circle or hemisphere, and afterwards always drawn in that way.

It is neither necessary nor desirable that special proficiency be attained in drawing one map before another is taken up. A single map may be drawn on any scale, but when maps of two or more grand divisions are drawn at the same time, as of North America and South America, care should be taken to have them on the same scale. Europe-Asia, or Eurasia, is very complicated in form, and, therefore, a map of it is best drawn in the hemisphere, though it may be traced from the card form first with profit.

A few of the principal mountains, rivers and cities should be represented on these maps as indicated. Some useful and interesting facts (given to pupils in this grade by the teacher) should be associated with each of these features as they are put on the map.

The pupil should not put North America and South America in a circle, or draw a map of the Western Hemisphere, until after he has taken up the globe as a whole and has a clear idea of what hemisphere means, the Western Hemisphere of the earth, and a map of the Western Hemisphere (all of which will be made plain by reference to illustrations and maps in this book.)

The Eastern Hemisphere should be next taken up in the same way. The Equator and Central Meridian should be put in all circles before map is drawn.

---

## FOURTH YEAR.

The work indicated for the third year may be profitably continued and expanded in the fourth year.

The child should be brought iuto contact with nature as much as possible. This is of great importance.

Forms of land and water, such as hills, valleys, plains, islauds, lakes, ponds, brooks and brook basins, springs, bays, etc., should be studied carefully from nature where practicable. Next to this, or in connection with it, pictures of these features should be freely used. The sand moulding board may be used with profit to represent the comparative size and relation of physical features, not to give original concepts of them. It should not be used to represent large sections of country.

### Excursion to the Hills.

Singly, or in groups, pupils may visit the neighboring hills for a definite purpose, accompanied by the teacher when possible. The following may prove suggestive: Things to be found out.—Do the hills form chains, or ranges, or are they scattered irregularly? Are there table lands or plateaus? Do any of the hills have peaks? Are there streams flowing from opposite sides of the hills? Why do the streams flow in different directions? Which are the warmer slopes? Which are the dryer? Which slopes, if any, are wooded? Are there varieties of trees and shrubs growing on the hills that are not found in the valleys? Do the hills contain stone suitable for quarrying? Is there clay for brick-making, or sand for plastering? Are there metals of value? Is the land on slopes best suited to stock-raising, or grain growing? Are there farm houses sheltered by the hills?

Other excursions may be planned for the purpose of studying physical features, plant or animal life. Visits to waterfalls, or to wild gorges, to grand forests, to museums, may be made profitable.

The work of out-door observation may be carried forward in ways which will suggest themselves to the teacher who knows all the circumstances. The following plan may prove suggestive:

1. Once a month (or oftener) after school, or on Saturday, the teacher may go with her classes for field work, always having a definite purpose in mind.

2. The older pupils may be sent out in small groups with chosen leaders, each group having work unlike that of other groups.

3. Individuals may be selected to make special observations, each member of the class having something to do.

Out-door observations should be followed by in-door conversations about things observed. Observations of pupils should be compared and corrected, interesting additional facts presented, the results of lessons given in definite form and made a part of geographical knowledge. The older pupils should give oral or written reports of what they have observed.

Pictures from papers and magazines, and from other sources, will be found most valuable in giving true conceptions of mountains and other natural scenery, and should be used liberally. Things learned in the lower grades should be made the basis of all future work—constantly added to, but never lost sight of. Indeed, this is the valuable feature of this system, constantly progressive.

### MINERALS.

*Soils.*—Clay, loam, sand and gravel.
*Rocks.*—Limestone, sandstone, granite, quartz, flint.
*Metals.*—Iron, lead, copper, tin, gold, silver.
*Coal.*—What it is, uses of different varieties.

Pupils may be asked to join in making a collection of minerals, including specimens of clays, sands, gravel, rocks, metals, etc. The best specimens from the large number sure to be brought in, should be labeled and arranged on shelves in the schoolroom. The soils may be placed in glass bottles or in small open boxes. The uses to which the different minerals are put should be a matter of observation and report.

Call the attention of pupils to the crumbling sandstone, to the slowly wasting limestone, to the loosened crystals on the boulders, to the washing of banks of clay, to the drifting of sand, showing the agency of frost, of water and wind in forming soils or wastes and in changing the aspect of the earth's surface.

### PLANTS.

*Common trees and their uses.*
*Common plants used for food, clothing, medicine, etc.*

The plants cultivated for their food, fiber, oil; the wild plants valued for their fruit, their flowers or medicinal qualities; the plants which beautify our homes, and the chief forest trees and shrubs should be known by their common names if by no other.

Talk about and make lists of plants that grow in the house, in the garden, in the field; of plants that are grown for their roots, their tops, their seeds, their fruit, their fragrance; that grow in the forest, in the open land, in the water; that creep, that climb, that come from other parts of the earth; talk of evergreen trees; of deciduous trees.

Pupils will take pleasure in forming a cabinet of woods. Let them bring a specimen of wood from every kind of tree and shrub growing in the vicinity, cut in sections of uniform length; varnish, label and arrange on shelves. Besides the names of the wood write on each section what the wood is used for chiefly.

With little labor the seeds of many varieties of plants may be gathered, put in small glass bottles, labeled and arranged on shelves.

Watch the opening of buds in spring, the season of blooming; and the changing foliage of autumn.

The distribution of seeds over the earth by natural means may be made the subject of profitable conversation, the dandelion, the soft maple, the cottonwood, the burdock, the famed Russian thistle and other plants in their season, furnishing seeds worth talking about.

Talk about the things found in a grocery store. *Where* and *how* they were produced and how they came to us. Where convenient have objects brought before the class when discussed.

### Some Wild Animals.

The especially useful animals—beasts, birds, fish, insects should be made the subject of out-door study. Learn their habits, how they serve us, our duty towards them.

Find out the following: animals that live on land, in the water, in the air; that make their homes in the earth, build their nests on the ground, in trees; that live in the woods, in open land, that live on seeds, on insects or flesh; that fly, that swim, that leap, that hop, that run; that live here all the year, that go away in autumn and return in spring; that live in warm lands, in cold lands.

Study the language of the hen, the dog, the cat, the horse, the cow. Have pupils tell the meaning of some of the sounds made by animals. Notice the different kinds of feet and teeth animals have and how they use them. Observe their means of defense and of escape from danger; how they are protected from the cold.

### The Weather—A Simple Weather Record.

Is the weather cold? moderate? warm? damp? dry? calm?

### Map Drawing, Etc.

All map drawing up to the last of the fourth or first of the fifth year should be free hand. After that, pupil should learn to use diagrams or construction lines.

The thought is not to confine or limit the pupil to just the things indicated in the text-book or on the map, but that he shall make note of and locate on his map every place that may be brought to his attention, through reading, language work or conversation, and that these places become thereafter a part of his geographical vocabulary, to be added to his list of things known. Teachers and pupils should make such supplementary lists to be passed on to the upper grades with the class.

As soon as the map of the Western Hemisphere is drawn by pupils, they should be required to locate especially prominent places in the United States (which should be marked off early). Such places should be far more numerous than those in other countries. Something of the products of one's own state, a few of the principal towns, bodies of water, etc., should be learned from a state map, and the position of this state should be indicated (not drawn) on the hemisphere map. No state map should be drawn at this stage, as it is very necessary to keep thoroughly in mind the comparative size of all countries.

Some idea of the size or extent of any country, such as North America or the United States, may be given in the following manner: Take two places (one of which is the home of the pupil) on the hemisphere map whose distance apart is about one hundred miles, and which is known to many of the pupils from experience in riding over it. Point these places out on the map. Determine by questions how long a time is required to go from one place to the other on the cars, on foot; and then, how much longer it would take to go the greater distance, across the country in different directions, using the first distance as a basis of comparison.

In this connection, it may be said that lengths, widths, depths and areas are of such paramount importance to the student of geography that we should have both boys and girls determine distances by careful measurements. Find the length, width and height of the school-room. On the floor draw a circle eight or ten feet in diameter. In the yard set stakes fifty feet apart; one hundred feet apart. Measure to some tree, post, rock or other object just one hundred feet from the school building; set a stake one thousand feet away. Find the height of the tree in the yard; the height of the school-house; the width of the road or street. Fix on two objects, houses for instance, that are a mile apart; on a grove, a village or a dwelling that is four or five miles from the school (if in sight, all the better). Select a tract of land (one or more farms) containing one square mile; call attention to the fact that a Congressional township contains thirty-six square miles—is six miles square.

These measurements are always before the pupils, and should be used at every step to aid the imagination. When not so used, the tall trees, the broad streams, the deep canons, the towering peaks, the grand cataracts told of in the text-book are but little things, and geography a dull and meaningless study. Lay these measurements across the rivers, rear them beside the cliffs, let them down into the sea; take imaginary journeys up the mountain steeps on the backs of mules, cross deserts with the caravan, the ocean in steamships, the continent on trains, and geography will have a meaning, an interest it never had before.

Maps should be drawn on black-boards as well as at seats. Careless work should not be accepted.

By constant comparison and allusions lead pupils to understand that their flat maps represent a country diversified by hills, plains, mountains, valleys, lakes and rivers, such as they saw on their trip over the country.

There should be no attempt at this stage to make relief or sand maps of any country or section of country. The relief of such maps must of necessity be grossly exaggerated and misleading. This work will come in due time and as a natural consequence after the great fact of contour, mountain, plateau, river, low plain and desert have been located and learned. There should be much oral drill in giving the directions of places from homes of pupils and from other places. The pupils should, of course, first have a mental picture of the position of all these places on the map. Position and direction of places must not be learned in any other way. The pupil needs practice, however, in oral expression of all that he knows and expresses in other ways.

A variety of devices may be used to secure attention and interest. Pupils can make journeys to distant points, giving the direction they would take and naming all the lands or waters they would pass or go over on the way. Or they might suffer an imaginary shipwreck and be cast upon some island or cape, and be required to name two routes home, with directions, land and water passed over, as before.

Questions should be brought before the school for consideration. The following might be written on the board to be answered on a Friday afternoon, others following from time to time:

1. Have the rain clouds any connection with the springs?

2. Why is the soil of the valleys usually richer than the soil of the hills?

3. Where the soil of the valley is very sandy, what kind of rock may often be found along the borders of the valley?

4. Were the valleys always as wide and deep as we now see them?

5. How were the pebbles in the knolls and along the beach rounded and so smoothly polished?

Such questions awaken thought, especially when ample time is given to find out. The teacher herself should be able to give clear answers whenever her pupils fail. The interest will then be great.

Pupils should be encouraged for well-doing in map drawing, and judiciously corrected for faults. Only one or two corrections should be made at a time, the most important. But these should be insisted upon. Aim to secure greater and greater accuracy each day. The purpose in map drawing is to fix in the mind the form and size of all continents, islands, bodies of water, etc., with their relations. If diagrams or such devices are resorted to too early, the main thing, *the form* *itself*, will be lost sight of in the effort to remember *how* the map should be drawn. The devices will be remembered for a time, but at the sacrifice of form. Devices are used to secure greater accuracy of form, and to give the mind a definite basis for criticism after the form has become fairly well fixed, and should always be subordinate to the form itself.

*Map drawing is not an end, but a means, and should be so used.* Great accuracy is not essential to the end sought—general form, comparative size, relation—still it has value and gives satisfaction to the teacher and pupil, and is worth all the extra pains required to secure it. Map drawing should be freehand up to about the fifth grade, as already stated.

The coast line is first drawn in even and continuous outline, and later broken as represented.

Pupils should copy from the model maps frequently, sometimes tracing them (for a change) on thin paper, and drawing them from memory as tests. An excellent exercise is to have pupils cut out paper forms of continents and the large islands and place them on a cardboard disk in proper position.

NOTE.—The diagrams given in this book are the result of much study, and they have been carefully tested in the school room. They are both simple and logical. Only natural relations have been sought. All diagram lines are derived from a common unit, the distance across South America on the equator. As few lines as possible are given. Coast lines should be learned from maps. The diagrams should be used as given, without modification. Pupils who have little idea of form will find diagrams a great help, and all pupils will draw maps more quickly and accurately by means of them.

## FIFTH YEAR.

During this year the plants and animals of the different zones should be taken up more thoroughly and in greater detail than heretofore, and especially the principal food and clothing plants. The pupil should be encouraged to look for this fuller information in his geography and other books to which he may have access.

Have the pupil take frequent imaginary journeys to different parts of the earth, describing the climate, lands and waters, scenery, people and products along the route.

Pupils should now learn to draw their maps by diagrams or construction lines and discuss proportions.

Physical or relief maps should be drawn and cross sections of any country made; the separate countries marked off and the lines of latitude and longitude indicated.

## SIXTH AND SEVENTH YEARS.

In the *Sixth and Seventh years* the work should be enlarged. Enter into greater detail of elevation, slope, climate and other physical conditions, and products and peoples of the different countries of the earth.

Maps of the separate countries should be enlarged from the hemisphere maps and such details as desired put in and studied. Drawing the United States in detail (marking off the separate states) should be left till about the 6th year, though it may be studied from a text-book quite fully before this.

---

## GENERAL REMARKS.

This scheme or limit of work is given simply to suggest what may be accomplished in a given time. Those schools having more time to give to the study can readily and profitably expand and enrich the work. It should be remembered that the text-book contains the essentials only of the study. There is a broad field outside, simply hinted at, which the progressive teacher will draw from continually and encourage her pupils to do likewise. *All should become investigators.*

All facts as to products, people, or country that may incidentally and legitimately come before the pupil, should be associated with their particular region on his map in addition to all that the book contains.

After pupils have become proficient in map drawing by using diagrams, these should be gradually disused, carrying them in the mind only for comparison and criticism. *The form should be dominant.*

Pictures, of which there is an abundant supply, should be made use of in illustrating different features of the work, such as scenery, cities, people, occupations, modes of living and conveyance, etc. These and striking facts should be used to fix characteristic and great historical events at the same time with location.

Books of reference, travel, exploration, biography, of information on important articles and of customs of people, and descriptions of countries should be used. Pupils can do much of this reading outside of school and make reports of it to the class. Copies of such books should be kept on the teacher's desk, where the pupils can have free access to them.

Practice in map drawing should not be neglected.

After the hemisphere maps are once drawn, they should be drawn as often as twice a week, and in the fifth and sixth years as often as once in two weeks as review, indicating all features learned. By using initial letter of geographical features, much time and space can be saved. This work should be repeated occasionally during the remainder of the grammar and high school course. It will prove a highly useful adjunct to the study of history, physical geography and literature.

Compasses should be used in the upper grades for describing circles; in the lower grades disks of cardboard may be used.

Care should be exercised to have hemisphere circles of same size when drawn together, whether on blackboard or on slates or paper.

The maps used as models to copy from should be as perfect as possible and constructed on the *same projection*.

A map of any grand division or country should be modeled after the forms used in the hemisphere, though it may exaggerate some of the features. This exaggeration cannot be overcome entirely by any system of map drawing on flat surfaces. All countries are on the surface of a sphere, and can only be truthfully represented on a sphere, but this is impracticable for common purposes. The margin of the map is especially exaggerated, but to attempt to modify or change this in the child's mind, will only lead to confusion, and the loss of the great end sought, namely: position, comparative size, relation, which far outweight in value all these defects.

No two maps of the same country though drawn on the same scale will agree unless drawn on the same projection. The distance between any two places on a flat map cannot be exactly found in miles though the latitude and longitude may be. The central portions of the hemisphere map are nearly correct but constantly exaggerate from center to margin, where the exaggeration amounts to more than one half.

(The exact amount of exaggeration can be determined by comparing the central meridian with half the circumference of the hemisphere. The central meridian,—half the circumference—and all intermediate meridians of the flat map, represent corresponding meridians of the half globe or sphere, on which all these lines are equal. On the flat hemisphere map the central meridian becomes the diameter of a circle, of which the outer meridian is half the circumference. This is about fifty-seven-one-hundredths longer than the central meridian, and is the amount of exaggeration at margin.)

The latitude and longitude of all places are correct.

In estimating distances between places in miles, allowance can be made for this exaggeration near edge of map.

Whenever a country or section of country is to be treated in detail, and a large view of it is desirable, the grand division containing the country (properly marked off) should be represented first and then the country itself should be drawn on large scale, or "magnified," from that.

Later, in the advance work in geography, the pupil should be required to construct a map on the Mercator projection, and to give other views of the earth on the projection he has used in his hemisphere maps. This latter can be accomplished by first drawing hemisphere maps in customary way, indicating the latitude and longitude of all points. Then, with any other meridian desired as a central meridian of the new hemisphere to be drawn, construct the parallels and meridians, carefully marking the latitude and longitude of each point the same as in the other map. Connect these points by proper coast lines. This work must of necessity be slow. It tends to confuse the picture already in the pupil's mind and for this reason should not be employed except as an exercise and towards the last work in geography, when forms have been firmly fixed.

The following lists of books for teachers and pupils contain a few of the many good books which should be read in connection with the study of geography.

---

## BOOKS FOR TEACHERS.

Essay on Humboldt...........Aggassiz.
Life of Ritter.................Gage.
Comparative Geography.......Ritter.
Geographical Studies..........Ritter.
Earth and Man...............Guyot.
The Earth..................Reclus.
The Oceans..................Reclus.
The History of a Mountain....Reclus.
Lessons in the New Geography.Trotter.
Teaching of Geography........Geikie.
Methods and Aids in Geography.King.
Physiography.................Huxley.
Physical Geography of the Sea.Maury.
First Book of Geology.........Shaler.
The Story of our Country......Shaler.
Geography of the Oceans.......Williams.
The Earth as Modified by Human Action....................Marsh.
The Ocean World.............Figuier.
Elementary Lessons in Physical Geography.................Geikie.
Mathematical Geography.......Jackson.
Astronomical Geography.......Jackson.
Formation of Vegetable Mould.Darwin.

## BOOKS OF REFERENCE.

All of the Cyclopaedias.
Stanford's Compendium of Geography and Travel. (6 vols.)
Brown's Countries of the World. (6 vols.)
Brown's Peoples of the World. (6 vols.)
Physical, Historical and Descriptive Geography.............Johnson.
Cosmos......................Humboldt.
The Earth and its Inhabitants..Reclus.
The Natural History of Man...Pritchard.
The Dawn of History..........Keary.
Physical Geographies of Guyot, Maury, Appleton, Warren, Houston, Hinman.
Forms of Water...............Tyndall.
Depths of the Sea.............Thompson.
The Ice Age in North America.Wright.
Sketches of Creation..........Winchell.
Le Conte's Geology
Geography of River Systems...Lawson.
Popular Astronomy...........Newcomb.

## BOOKS FOR PUPILS.

### Third and Fourth Grades.

Seven Little Sisters............Andrews.
Each and All.................Andrews.
Little Lucy's Wonderful Globe. Yonge.
Little Folks of Other Lands.
Children of all Nations.
Aunt Martha's Corner Cupboard. Kirby.
Sea and Sky..................Blackinton.
Children's Fairy Geography....Winslow.
The Rollo Books..............Abbott.
Madam How and Lady Why....Kingsley.
World at the Fireside..........Kirby.
Little Folks in Feather and Fur. Miller.
Life and Her Children.........Buckley.
Ten Boys of Long Ago........Andrews.
Natural History Readers.......Wood.
Georgie's Menagerie.
My Feathered Friends.........Wood.
Hans Brinker.................Dodge.
Home Geography.............Long.

### Fifth and Sixth Grades.

Our American Neighbors......Coe.
Modern Europe...............Coe.
Zigzag Journeys..............Butterworth.
Our Boys in India.............French.
Our Boys in China............French.
Boy Traveller Series...........Knox.
Little People of Asia...........Miller.
Young Folks Abroad..........McCabe.
Young Folks in Africa.........McCabe.
Life in the North.............Schwatka.
Orient Boys..................Keene.
Up the Tapajos...............Ellis.
Lost in the Wilds.............Ellis.
Two Years Before the Mast.....Dana.
Scribner's Geographical Reader.
Knockabout Club in the Tropics. Stephens.
At Last......................Kingsley.
Alaska's Great River..........Schwatka.
The Bodleys Abroad..........Scudder.
Homes Without Hands........Wood.
Stories of Australia, India, China, Northern Europe and England.
Stories of Industry—Vols. 1, 2.
Articles in Readers and Magazines.

### Sixth and Seventh Grades.

The preceding list with the following additions:

Humboldt's Travels.
What Darwin Saw.
The Pampas and the Andes....Bishop.
The Wanderers in Trinidad and up the Orinoco..............Kingston.
Florence Stories...............Abbott.
Holland and its Peoples........De Amicis.
Sunny Spain..................Patch.
The Land of the Midnight Sun. Du Chaillu.
The Abode of Snow...........Wilson.
The Roof of the World........Gordon.
Land of the White Elephant....Vincent.
Tent Life in Siberia...........Kennan.
Sailing on the Nile............Laporte.
Among the Huts in Egypt.....Whately.
In the Wilds of Africa.........Livingston.
Lost in the Jungle.............Du Chaillu.
Central and South Africa......Taylor.
How I Found Livingston......Stanley.
Journey Across Australia......Mortimer.
Ocean Wonders...............Damon.
Open Polar Sea...............Hayes.
The World of Ice.............Ballantyne.
The Last Days of Pompeii......Bulwer.
Across Asia on a Bicycle.
General History.
Literature.
Magazine Articles.

# THE STORY OF THE EARTH.

## I.

In olden times people believed that the earth was flat, and, if one traveled far enough in any direction, he would finally come to its end or edge; but, as time went on and men made longer and longer journeys from home without seeming to come any nearer to the end, some began to think that the earth could not be flat after all, but round like a globe or ball.

Among those who held this view was a sailor named Columbus. He felt so sure about it that he was quite willing to sail out on the great ocean far away from land, and by going *west*, try to reach the Indies—a country so rich in precious stones, spices and fine fabrics that the chief nations of Europe at that time sought its trade.

The journey to that country was a very long one, requiring many months. It was made partly by water and partly by land. The land part of the journey was by caravans, and, as all goods had to be carried on the backs of animals, it was very slow, tedious and costly; besides, the people along the way finally became very hostile and gave much trouble.

All believed it would be much better if the whole journey could be made by water, and articles of trade carried in ships, even if the distance were much greater. So, many efforts were made to find a water route to the Indies.

The Indies lay far to the *east*, and no one thought of reaching that country by going in the opposite direction, or *west*, as Columbus proposed to do.

Columbus reasoned that, if the earth was round, any place on its surface which could be reached in one direction could also be reached by going in the opposite direction. Take an apple, or ball or a globe and see if this is true.

In those days many people believed the ocean was full of frightful monsters that would devour men and ships if they ventured too far, and no one dared sail much out sight of land.

It seemed to them that Columbus was foolish to attempt such things, and they called him crazy. They said if the earth was really round, as he claimed, he could not get back up the great hill of water when he had once sailed over it, and so he would never be seen again.

Columbus persisted in his undertaking, however, as you all know, and made a famous voyage. He sailed farther from home than any one had ever done before, and came to a country which he thought was the Indies, and, as he had gone west to find it, called it the *West* Indies.

It was afterward found that he had not reached the Indies, but had discovered an entirely new country, and it was called the NEW or WESTERN WORLD.

After this, most people believed that the earth was round, and one brave navigator, Magellan, thought he would sail around it, and started out to do so. He died on the way, but his crew and ships made the great journey after sailing in the same general direction for three long years.

## II.

Since the time of Columbus people have visited nearly all parts of the earth for purposes of trade or discovery, and have told of the many interesting things they have seen and found on sea and land. Some people have written books telling of their journeys and discoveries. From them we learn that a vast ocean covers most of the earth and surrounds all the land.

Were we standing on the wharf of a great seaport like New York, we could see coming in and going out ships from all parts of the world, with different flags, and with crews speaking different languages.

Some of the sailors on these ships have visited countries where it is always summer, and they could tell us of the beautiful birds and flowers and of many fine fruits, such as oranges, bananas, and dates, which grow there, as well as of some very strange plants, such as the bread-fruit tree and the cow tree, from which people get bread and milk.

Others have visited regions where it is always winter, with the ground covered with snow and ice, so that no tree or any green thing, save moss and a few other small plants, can grow; where the people dress in furs and live in houses made of ice, and where the nights are sometimes many months long.

Others still could tell of places where rain falls most of the time, and all vegetation grows in the greatest luxuriance; of forests covering vast regions, and so dense that one could not walk through them; and then again of other places where rain never falls, barren wastes of sand and dust which one may journey over for days without finding water, or seeing a blade of grass or anything green.

Others could tell of tracts of land without mountains or hills, great plains extending in all directions, some just barren wastes, others covered with grass, and still others with dense forests; of mountains so lofty they appear to reach the skies, with tops snow-covered all the year round and often wrapped in clouds; and of other mountains which throw out fire and vapor in such quantities as in some cases to destroy and bury whole villages; of islands in the ocean which have been made by these fire mountains, or *volcanoes;* and of other islands, beautiful with trees and flowers, built by little animals of the sea, called *coral-polyp.*

They could tell of many strange and interesting animals of sea and land; of people of the cold north, and of the warm and sunny south; of men who live in caves and huts and fight with bows and arrows; and of men who build beautiful cities and send ships to trade with all the world.

They could show us that most of our choicest fruits, nuts, spices, and fine fabrics for clothing come from lands far away over the sea. Indeed, the sailors unload these very products from their ships as we wait and they take on the products of our own country in exchange.

We shall be interested to know more of all these things,—of this wonderful earth, our home; of its surface of land and water; of its animals and plants; and of its people,—where and how they live, and all about them.

The study that tells us about these things is called *Geography*.

## Some Things to Learn and Remember.

Many people now go around the earth every year. There are other reasons besides this for believing the earth is round. Among them is one that can readily be understood by all.

If you should stand on the shore looking at a ship as it goes out to sea, you would notice that its lower part or hull disappears first, and the top-sails last. If the ship were coming in, the sails would appear first and the hull last. Now this could not be unless the earth is round.

We know that the sun does not rise or set at all as it appears to do, and as people used to think. The earth turns, or *rotates*, on a line running through its center called its *axis*, something as a top does, so the sun shines on different portions of it each day, thus giving us day and night. This axis always points towards the North Star. Its ends are called the *poles*. The end next the North Star is called the *North Pole*, and the opposite end, the *South Pole*. A line supposed to be drawn around the earth midway between the poles is called the *Equator*.

We stay on the surface of the earth somewhat as iron clings to a magnet.

*Down is always towards the center of the earth, or towards our feet as we stand erect, and up is in the opposite direction.*

Men have measured the earth and found that its distance around, or *circumference*, is nearly 25,000 miles. From this they know that the distance through it, or its *diameter*, must be about 8,000 miles. It is so large the small portion seen at one time looks flat, and we can well understand how it was that the ancients thought the earth was a great plain.

Names have been given to the five parts of the great ocean or Sea, as it is often called. They are the Pacific Ocean, Atlantic, Indian, Antarctic and Arctic.

The lesser bodies of water are called, in order of size, seas, lakes, ponds.

The waters of the Sea and of some lakes are salt and unpleasant to the taste. Most other waters are fresh.

The larger bodies of land are called *Continents.* They are North America and South America in the western half of the world, or Western Hemisphere, and Eurasia (Europe-Asia), Africa and Australia in the Eastern Hemisphere. North America, South America, Europe, Asia and Africa are sometimes called Grand Divisions; and Australia, an island.

All the smaller bodies of land surrounded by water are called *islands.*

*Oceania* is the name given to a portion of the Pacific Ocean containing many islands.

A *Coast Line* is the border of all land where it meets the water. It usually means the land which borders the ocean and its arms.

It is found that the bottom of the sea is very much like the surface of the land. It is composed of plains, plateaus (high plains), hills, valleys and mountains. Islands are just the tops of ocean mountains or plateaus.

Many plants grow in the sea, and are called *marine plants.* The most common is seaweed. It sometimes covers large areas and is so thick vessels pass through it with difficulty. The Spaniards called these places *Sargasso* (grassy) *Seas.*

A *Peninsula* is a body of land almost surrounded by water. The narrow neck of land which connects a peninsula to another body of land is called an *Isthmus.*

A narrow passage of water connecting two larger bodies of water is called a *Strait;* if wide, a *Channel.*

A point of land extending into the water is called a *Cape;* if high, a *Promontory.*

Parts of bodies of water extending into the land ("Arms of the Sea") are called *Seas*, *Bays* or *Gulfs.*

A *Mountain* is the highest elevation of land.

A *River* is a large stream of water flowing through the land.

See if you can find these forms of land and water on a small scale near your home. Find them on a globe and the Hemisphere maps.

The Hot Regions are about the Equator all around the earth, the Cold Regions, around the Poles, and the Moderate or Temperate Regions are between the Hot and Cold Regions—one on the north of the Hot Region and one on the south of it.

A large town is called a *City.*

The *Capital* of a country or state is the place where the laws are made and the chief officers live. Washington is the capital of our country. A *Seaport* is a town or city on or near the sea, having a harbor that can accommodate vessels.

The largest city of a country is called the *Metropolis.*

The common road which goes by the school house connects with every other road and leads to every town and home on the main land of America. The railroad track, wherever we see it, connects with all others in the country, and on it we may ride to Boston, San Francisco, New Orleans and to every other important town in the land.

These two kinds of roads are the great highways of travel and traffic on land.

Rivers, canals, lakes, seas and oceans are the great waterways of commerce.

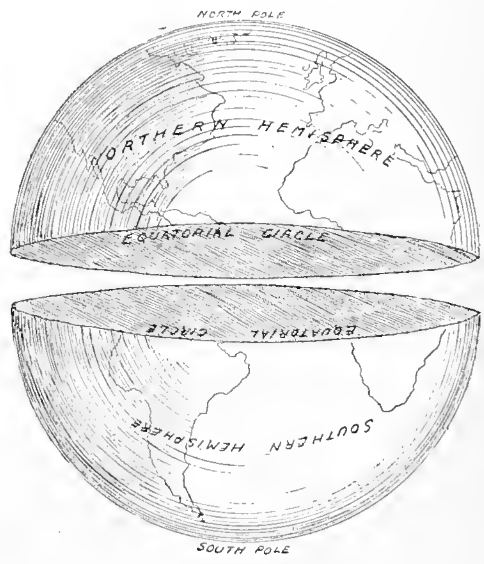
### Maps.

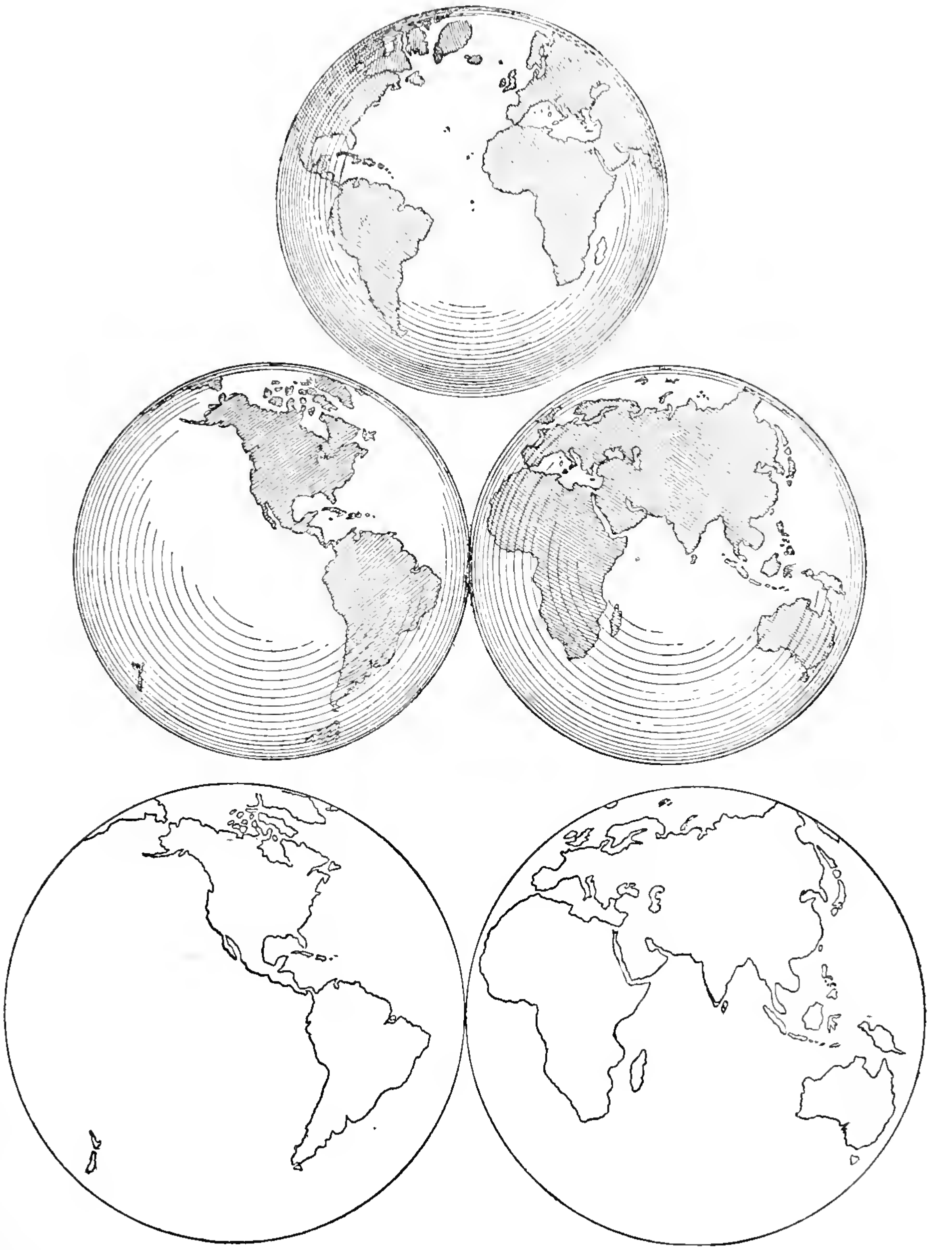
In order to study the earth as a whole, or to learn of the form, size and position of the different parts, we must have it represented on a much smaller scale, just as it is necessary for a builder to have the plan of a house drawn on a sheet of paper. The best representations of the earth are artificial Globes, on which are drawn the outlines of land and water.

Generally, it is most convenient to represent the earth, or portions of it, on a flat surface, something as the plans of buildings and grounds are shown. Such representations are called Maps.

Only half of a sphere or globe can be seen at a time. A half sphere is called a Hemisphere. The earth is usually represented as a whole by two hemisphere maps—Eastern Hemisphere and Western Hemisphere; also sometimes by Northern and Southern Hemisphere maps.

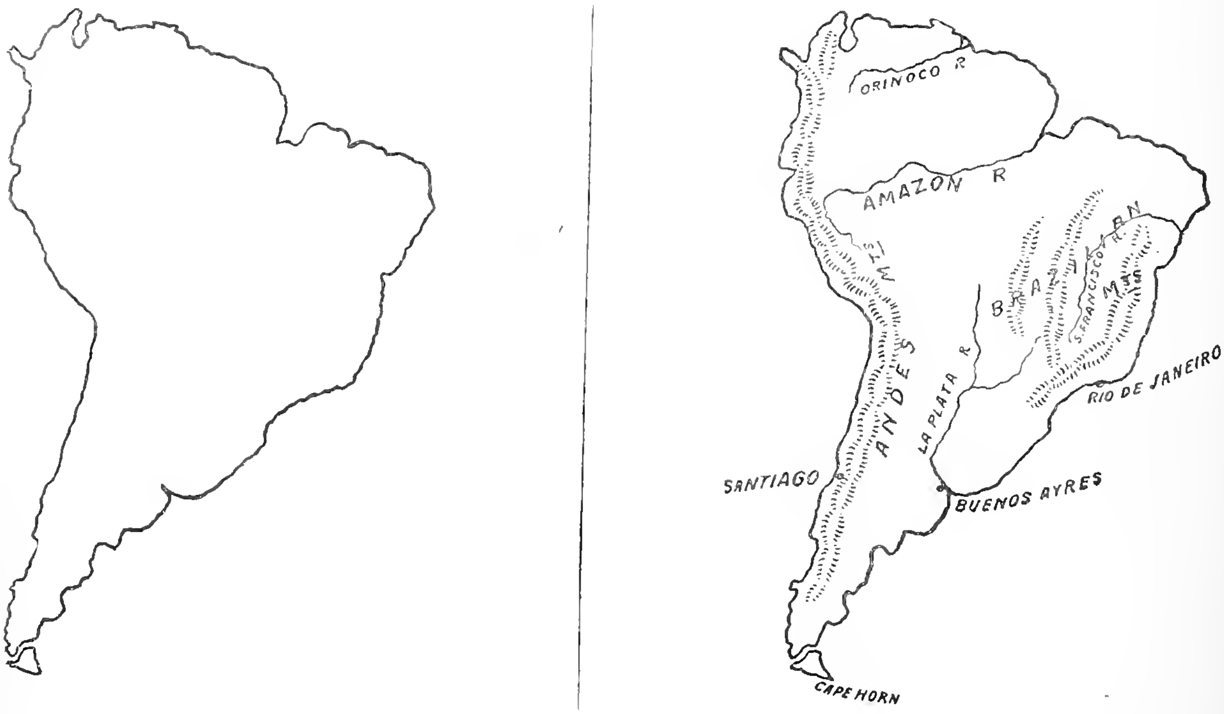
On most globes of the earth, and hemisphere maps, are drawn lines extending from pole to pole, called Meridians. There are also other lines drawn parallel to the Equator which are called Parallels, or Parallels of Latitude. Places are located by means of these lines, as we shall learn later, and the direction of one place from another on the maps is shown by them.



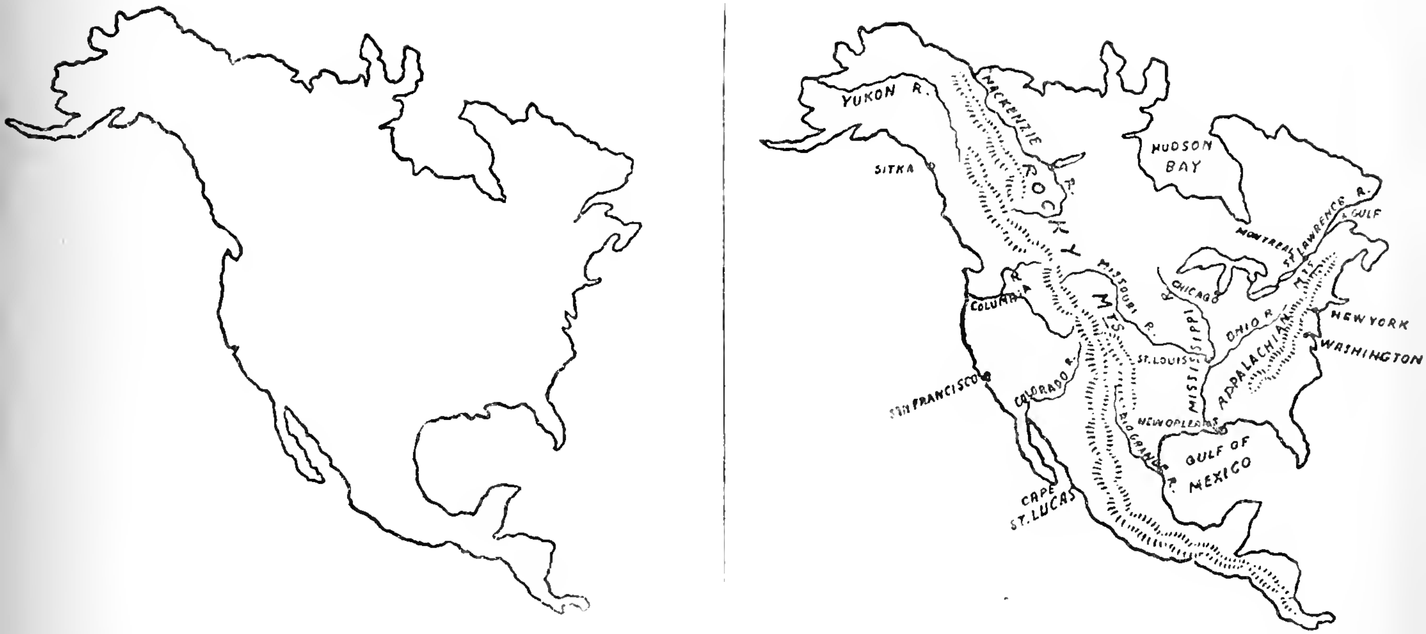
We have here:—

1. A picture of the world as a whole.
2. A picture of the halves of the world, or *hemispheres.*
3. Flat maps of these halves of the world, or *hemisphere maps.*



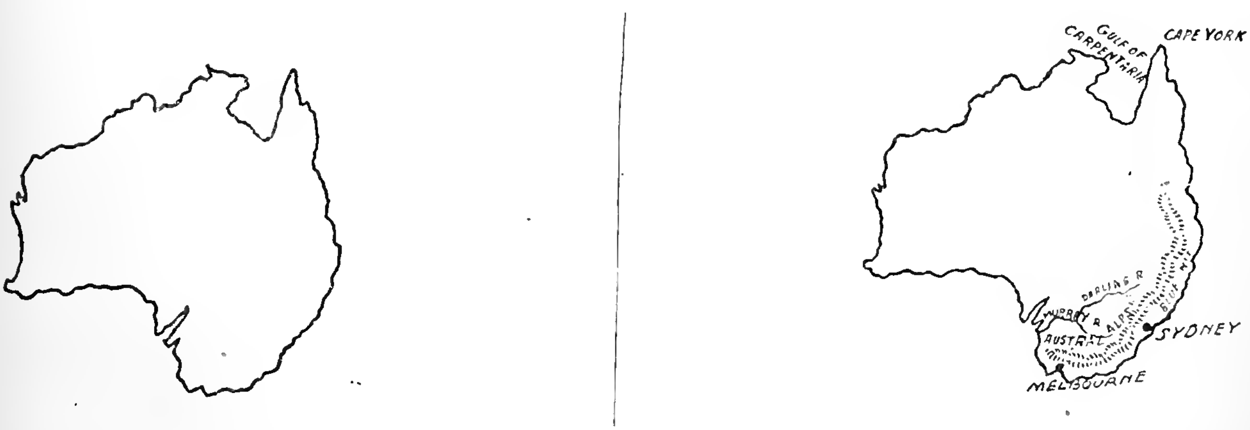

SOUTH AMERICA.

*To the Teacher:*—The outline of South America here given should be copied each day by pupils at beginning of third year. When fair proficiency has been obtained the features indicated on the next map may gradually be put in; and in the following order: mountains—Andes, Brazilian; rivers—Amazon, La Plata, Orinoco, San Francisco; cities—Rio Janerio, Buenos Ayers, Santiago, Cape Horn. Next the map of North America should be taken up in the same way. Features should be represented in the following order: mountains—Rocky, Appalachian; rivers—Mississippi, Missouri, St. Lawrence, Columbia, Yukon, Mackenzie, Rio Grande, Ohio, Colorado; cities—New York, Chicago, New Orleans, Washington, St. Louis, San Francisco, Montreal, Sitka; Hudson Bay, Gulf of Mexico, Gulf of St. Lawrence, Cape San Lucas. As the features are represented on the map by the pupils the teacher should state what they are noted for, or briefly describe them.




NORTH AMERICA.

*To Teacher:*—See instructions to teacher on page 28.




AUSTRALIA.

*To Teacher:*—See instructions on page 32. This map is to be copied *after* one on page 32.

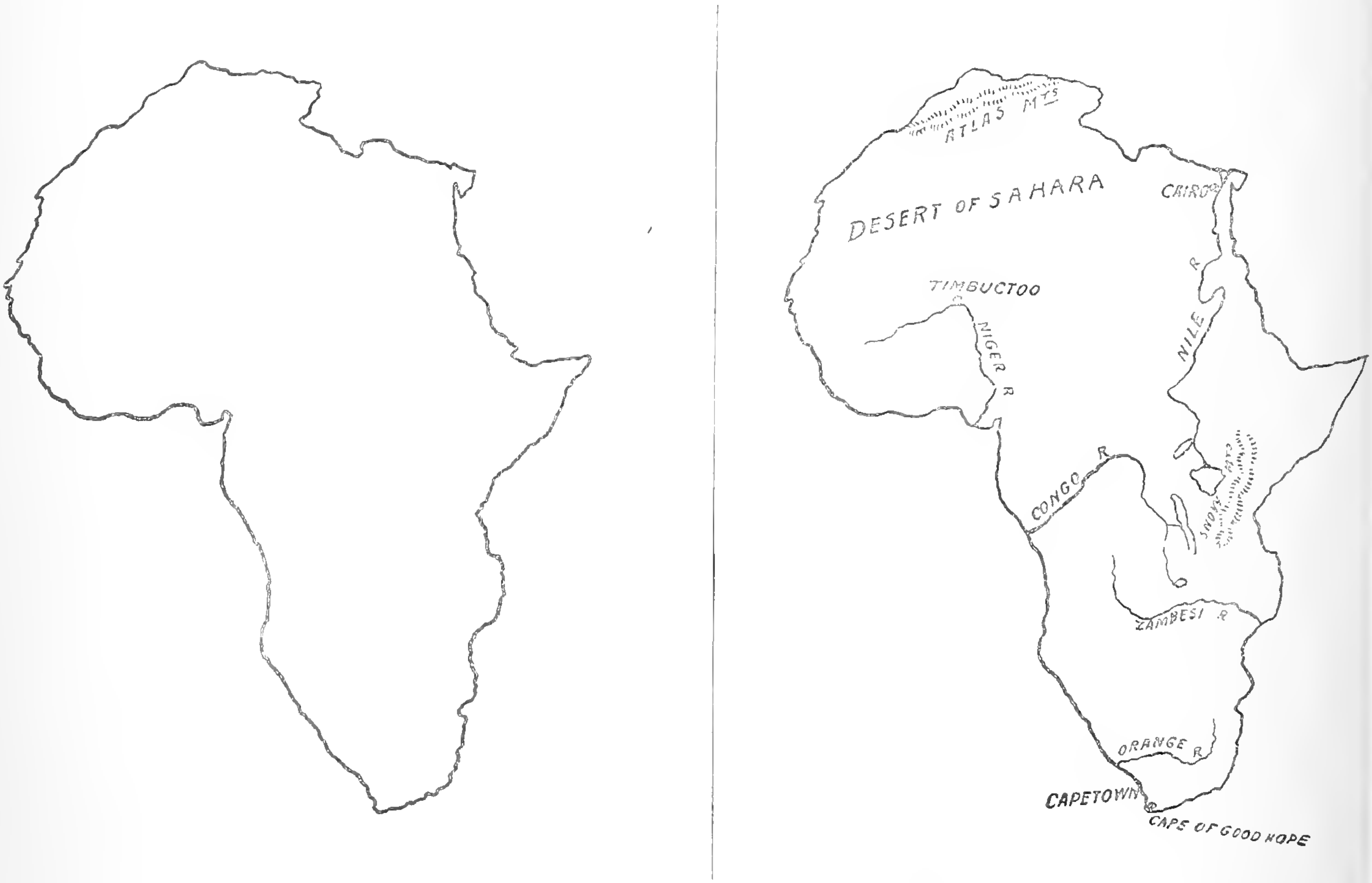
WESTERN HEMISPHERE.

*To Teacher:*—Pupils should copy this map, using it as a model.

The Equator and Central Meridian should always be put in the circle before attempting to draw hemisphere maps.


WESTERN HEMISPHERE.

*To the Teacher:*—Pupils should copy this map, gradually putting in all the features as indicated, with their names. They should be required to give oral expression to the mental pictures they have of places, by telling where they are located, the direction of any place from home and from any other place; also the route by water from one place to another, where possible. In no case should anything connected with the map be required in recitation that has not first been located on the map.




AFRICA.

*To the Teacher:*—After the pupils have gained fair proficiency in drawing the preceeding maps they should draw the maps indicated here, following the general directions given on page 28. For Africa the order should be; mountains—Atlas, Snow; rivers—Nile, Niger, Congo, Zambesi, Orange; cities—Cairo, Capetown, Timbuctoo; Desert of Sahara, Cape of Good Hope.

For Australia the order should be: mountains—Australian Alps, Blue Mountains, Victorian Mountains; rivers—Darling, Murray; cities—Melbourne, Sidney; Gulf of Carpentaria, Cape York. See page 29 for model map.

EASTERN HEMISPHERE.

*To the Teacher:* This map should be used as a model for pupils to copy. Slates or small sheets of paper will serve for this practice at first. In all grades above the third, where more details are required, a larger size map is necessary. Practice paper for these grades should be a foot square where a single hemisphere is to be drawn, and 1x2 feet where both hemispheres are to be drawn side by side. Circles should be drawn full size of paper. Heavy newspaper stock, properly cut, will answer quite well.

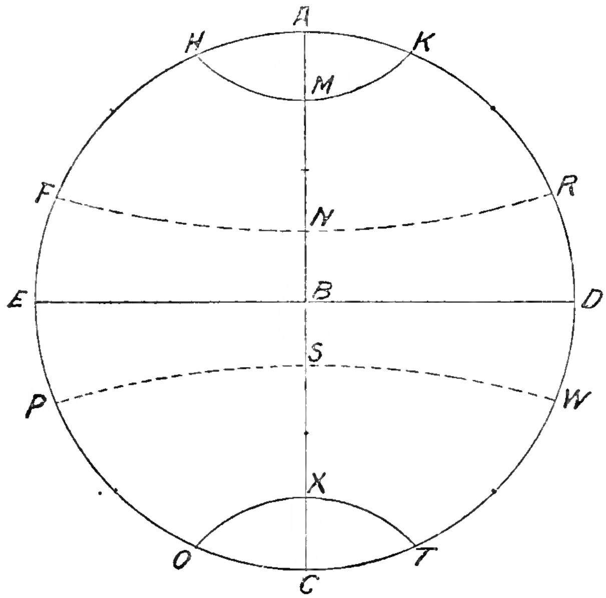

EASTERN HEMISPHERE.

*To the Teacher:* The directions given on page 31 for mastering the map of the Western Hemisphere will apply here, and should be carefully observed. Pupils should take up the features not already learned in about the following order: After the continents and islands have been drawn, the larger bodies of water should be located and named, then the mountains, rivers, cities, capes, bays and gulfs, straits and channels. All features named on the map should be located by the pupil on his map before proceeding to advance work. By the end of the third year the zones should be definitely marked off by proper circles. The zones should be explained, their climate and products. The names of the typical plants and animals of each zone should be learned by the pupil.

### HOW TO DRAW THE TROPICS AND POLAR CIRCLES.

Divide each of the parts of the circumference and Central Meridian between the Equator and the Poles, north and south, into four equal parts. Connect with the circle called the Tropic of Cancer, the first points in circumference and Central Meridian on the north of the Equator, and similarly those on the south with the Tropic of Capricorn.

In the same way connect the points nearest the North Pole for the Arctic Circle, and the points nearest the South Pole for the Antarctic Circle. For instance, in the accompanying figure divide E A, A B, A D, D C, C B, and C E, each into four equal parts. Then connect F, N and R with curved line—Tropic of Cancer, also H, M and K in same way—Arctic Circle, etc.




These Circles should really be drawn a little beyond the points named, as 23½ degrees is a little over one-fourth of ninety degrees (the distance from the Equator to the Poles).

(*To the Teacher:* Pupils should have some practice in drawing these Circles, and hereafter should use them in all Hemisphere map drawing. They will be of assistance in getting more perfect maps, and what is of more importance, fix the zones. Later, pupils should be able to name orally the different lands and waters in each of the zones. This can be learned quickly by requiring pupils to draw the hemisphere maps on slate or blackboard, and then erase all but the zone or zones to be considered.)

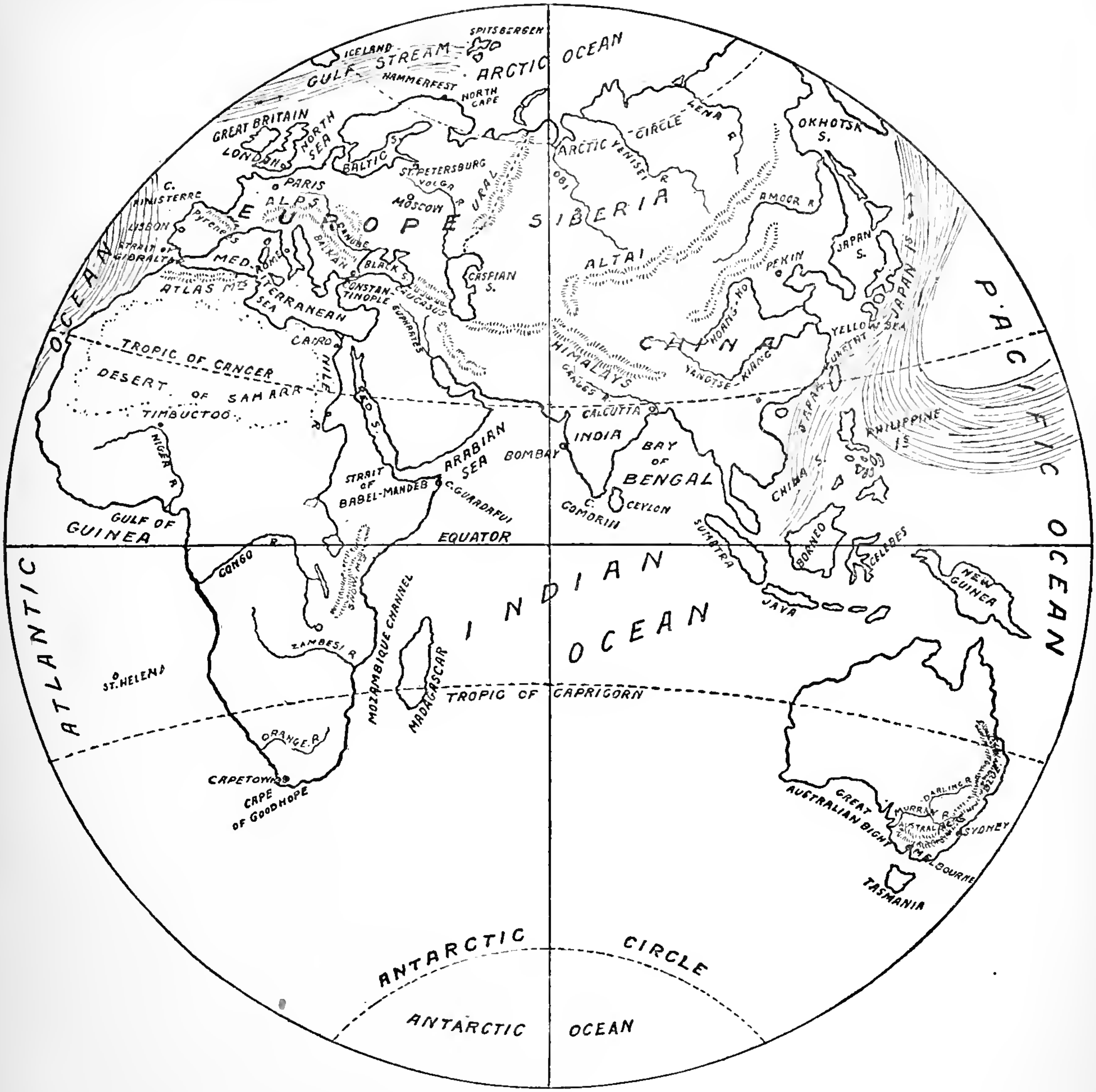
*To the Teacher:* The hemispheres are brought together here for comparison. These maps of the two hemispheres, the world, should be kept before the pupil's mind until they become fixed as a whole, and all of their parts—their relation, comparative size, form, etc. In order to accomplish this, the pupil should be encouraged to copy these maps as soon as possible, and on the same sheet of paper, side by side. It is desirable that he use these maps for outlines and the following two maps for details, instead of the single maps which come before. The details of one map need not be worked out before taking up those of the second. Indeed, it is better to carry the details of both maps along together, some in one and some in the other at the same time.

The nature and effect on climate of latitude, large bodies of water, ocean currents (especially the Gulf Stream and the Japan Current), winds (Trade and Return Trade) and altitude (mountains) should be explained in a simple way, and these features indicated on the maps.

Pupils should learn here what is said in their primary geographies about their own country, the United States.

Pupils may be readily taught to estimate distances in miles between places on their hemisphere maps. The distance around the earth is about 25,000 miles. One-half this, or the distance across their hemisphere maps in any direction through the centre would be about 12,400 miles; and one half this distance, or from the centre to circumference of the hemisphere would be a little over 6,000 miles. One third of this last distance, or the distance across South America on the Equator, would be about 2,000 miles, etc. These distances may be used as bases of comparison, or units of measure.


*To the Teacher:* See that the pupil draws his map and represents on it all of the features named in following lists, so that he can give their location orally from the *mental picture* he has of them. By questions and other tests satisfy yourself that the pupil is depending on this mental picture, and is getting the picture more and more accurate each day.




The work should be taken up as indicated. All of one part should be thoroughly mastered before proceeding to the next, and when once learned in this way, the impression should be kept fresh and intensified by constant review. At any point in the work all that has been taken should be at ready command. To secure accuracy of form pupils may practice drawing Grand Divisions outside of circle and on enlarged scale.

All features from the beginning are given in the following list for convenience of review and reference. Pupil should search for them in his own geography and locate them on his map as he forms it.

## The Continents.

Eurasia, Africa, Australia in Eastern Hemisphere; and North America and South America in Western Hemisphere.

These are sometimes called Grand Divisions (in which case Europe and Asia form separate Grand Divisions).

Oceans.—Pacific, Atlantic, Indian, Antarctic, Arctic.

Isthmuses.—Panama, Suez.

*Desert of Sahara, Suez Canal.*

Seas.—Caribbean, Bering, Mediterranean, Red (famous in Sacred History), Arabian, Black, Caspian, Yellow (so called from its color), East China, South China, Japan, Okhotsk, Adriatic, Java, Celebes, Sargasso Seas.

Straits and Channels.—Bering, Davis, Hudson, Magellan, Florida, Gibraltar, Mozambique, Belle Isle, Yucatan Ch., Bab-el-Mandeb, Malacca, Ormus, Sunda.

Capes.—Horn, St. Roque, San Lucas, Parina, Blanco, Sable (2), Hatteras, Pt. Barrow (most northern point of Alaska), Race, Farewell, Gallinas, Mendocino, Good Hope, Guardafui, Verd, York, Comorin, Rock of Gibraltar (strongest fortress in the world—belongs to the British), North Cape (most northern cape of Europe), Finisterre, Lands End, Spartel, Lisburne, St. Vincent, Brual.

Gulfs and Bays.—Gulf of Mexico, Hudson Bay, Gulf of California, Bay of Bengal, Baffin Bay, Gulf of St. Lawrence, Gulf of Carpentaria, Persian Gulf, James Bay, Bay of Biscay, Gulf of Guinea, Gulf of Siam, Gulf of Aden, Gulf of Bothnia, Gulf of Campeachy, Bay of Honduras, Tampa Bay, Chesapeake Bay, Delaware Bay, Gulf of Darien, Bay of Panama.

Most of the islands of the world are owned or controlled by the following nations:—Great Britian, United States, Germany, Netherlands, France, Spain, Portugal, Italy, Denmark. (See map of Europe.)

Indicate ownership of islands on your maps as you learn them.

### Islands.

Greenland (Denmark). Largest island in the world.

West Indies or Greater Antilles. Sugar, Tobacco.
- Cuba (Republic.)
- Hayti or San Domingo. (Two Republics—Hayti and San Domingo.)
- Jamaica. (Br.)
- Porto Rico. (U. S.)

Lesser Antilles. (To various nations.)

East Indies.
- Borneo. (Br. and Neth.)
- Papau or New Guinea. (Br., Neth. and Ger.)
- Celebes. (Neth.)
- Sunda Islands. Spices.
  - Sumatra. (Neth.) Pepper.
  - Java. (Neth.) Coffee.
  - Timor. (Neth. and Port.)

Philippine. (U. S.) Tobacco, sugar, coffee, rice.

Madagascar. (Fr.) Cattle, India-rubber,sugar, vanilla.

British Isles. Great Britain—Ireland. Most powerful and famous in the world.

Japan. Hondo—Yezzo. Rice, tea, silk, curios.

New Zealand. (Gr. Britain.) North--South—Stewart.

Sandwich Islands. (U. S.) Has a fine climate--sugar.

Tasmania. (Gr. Britain.)

New Foundland. (Gr. Britain.) Near great fishing grounds.

Iceland. (Denmark.) Eider duck, geysers.

Ceylon. (Gr. Britain.) Coffee, cinnamon, tea, cocoanut.

Nova Zembla. (Russia.)

Bermuda Islands. (Gr. Britain.) Early vegetables—fine climate.

Bahama Islands. (Br.) First land seen by Columbus in the New World.

Aleutian Islands. (United States.)

Pribiloff Islands. (United States.) Home of American fur seal.

Komandorski. (Russia.) Home of Russian fur seal.

Terra del Fuego. "Land of Fire."

Vancouver. (Gr. Britain.)

Baffin Land. (Gr. Britain.)

Southampton. (Gr. Britain.)

Falkland Island. (Gr. Britain.)

Marajos or Joannes. (Brazil.)

St. Helena. (Gr. Britain.) Place of Exile of Napoleon

Sicily. (Italy.) Fertile soil, sulphur, wines, fruits.

Sardinia. (Italy.) Sardines named from this.

Corsica. (France.)

## Mountains.

| Range. | Highest Peak. |
|---|---|
| Rocky (11,000 ft.) | Mt. Logan (19,500 ft.) |
| Appalachian (3,000 ft.) | Mt. Mitchell or Black Dome (6,700 ft.) |
| Andes (12,000 ft.) | Aconcagua (23,300 ft.) |
| Sierra de Espinhaco or Brazilian Mts. | Itacolumi (5,700 ft.) |
| Himalaya (19,000 ft.) | Mt. Everest (29,002 ft.). Highest range and peak in the world. |
| Alps (8,500 ft.) | Mt. Blanc (15,800 ft.) |
| Caucasus | Elburz (18,500 ft.). Highest in Europe. |
| Pyrenees (8,000 ft.) | Maladetta (11,000 ft.) |
| Ural (3,000 ft.) | Teplos (5,500 ft.) |

Mountains of East Coast of Africa ...... Kilimanjaro (19,600 ft.)
Scandinavian Mts.................... Ymesfield (8,500 ft.)
Apennines (4,000 ft.) ................. Corno (9,500 ft.)
Stanovoi.
Elbruz (In northern Persia)........... Demavend (21,000 ft.). Volcanic.
Australian Alps (5,000 ft.)............. Mt. Kosciusko (7,200 ft.)
Atlas Mts.
Kong Mts.
Thian-Shan (18,000 ft.)
Altai (6,300 ft.)
Yablonoi
Suliman
Mt. Vesuvius (4,200 ft.). Famous volcano which buried Pompeii and another city in one of its eruptions,—A. D. 79.
Mt. Ætna, Volcano (10,700 ft.)
Mt. Ararat (17,100 ft.). Famous in sacred history.
Blue Mt. (4,000 ft.)
Victoria Range. (The mountains of Australia are all low).
Mt. Cook (Vol. 12,300 ft.)
Mt. Fusiyama (Vol. 14,200 ft.)
Mt. St. Elias (18,000 ft.)
Mt. Sinai (9,300 ft.). Famous in sacred history.
Mt. Olympus (Turkey, 9,700 ft.)
Mt. Olympus (United States, 8,200 ft.)
Mt. Ophir (13,800 ft.)
Mt. Hecla (Vol. 5,100 ft.)
Mauna Loa (13,700 ft.) and
Mauna Kea (13,900 ft.). Two remarkable volcanoes on Hawaii, the largest of the Sandwich Islands.

## Rivers.

Amazon. Largest river in the world.
La Plata.
Orinoco.
San Francisco.
Mississippi. Longest river in North America.
Missouri.
Niger.
Zambesi.
Orange.
Volga. Longest river in Europe.
Yenisei.
Ural. This with Ural Mts. forms part of boundary of Europe.

St. Lawrence. In volume of water largest in North America. Noted for its rapids and fine scenery.
Columbia. Famed for its beautiful scenery.
Yukon.
Mackenzie.
Rio Grande.
Colorado. Has cut a long channel a mile deep through solid rock.
Nile. Overflows its valley at same time each year making it very fertile.
Congo. Largest river in Africa.
Obi.
Lena.
Amoor.
Yang-tse-Kiang.
Hoang Ho.
Ganges.
Indus.
Euphrates. The oldest nations lived in its valley.
Tigris.
Danube. Largest river in Europe.
Murray. Chief river of Australia.
Darling. Chief tributary of Murray.

CITIES.

New York. Metropolis and greatest sea-port of America. Next to London the largest city in the world, population over 3,000,000.

Chicago. Greatest railroad center and largest grain, beef and pork market in the world.

Washington. Capital of the United States.

San Francisco. Metropolis of the Pacific coast.

St. Louis. Metropolis of Mississippi valley.

Rio Janeiro. Greatest coffee market in the world. Metropolis of South America.

Buenos Ayres. Second largest city in South America.

Santiago. (S. A.)

Valparaiso. Important seaport.

London. Largest city in the world, population over 4,000,000.

Paris. Called the most beautiful city in the world, is next to New York in size—population nearly 2,500,000.

Berlin. Capital and metropolis of Germany—one of the great cities of the world.

Rome. One of the oldest and most famous cities in the world—home of the Pope.

Vienna. Beautiful city—metropolis of Austria.

St. Petersburg. Built by Peter the Great—Capital of the Russian Empire.

Moscow. Formerly capital of Russia.

Lisbon. Capital of Portugal—destroyed by an earthquake (1755).

Madrid. Capital and metropolis of Spain.

Constantinople. Famous city—capital of Turkey.

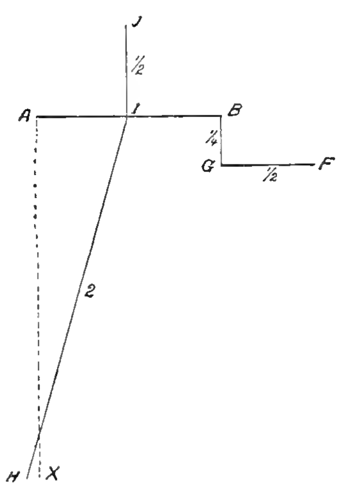
Pekin. Capital of Chinese Empire.
Canton. Great seaport.
Tokio. Capital and metropolis of Japan.
Calcutta. Metropolis of India.
Bombay. Next to Calcutta the most important city of India.
Cairo. Metropolis of Africa.
Cape Town. Most important town of southern Africa.
Alexandria. Built by Alexander the great.
Timbuktu. Important French trading post.
Melbourne. Capital and metropolis of Australia.
Sidney. Next to Melbourne in size.
Marseilles. Great Seaport.

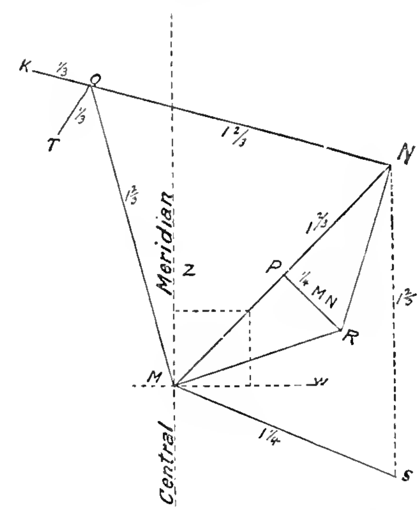
## Directions in Full for Drawing Maps by Diagrams.

### *Western Hemisphere.*

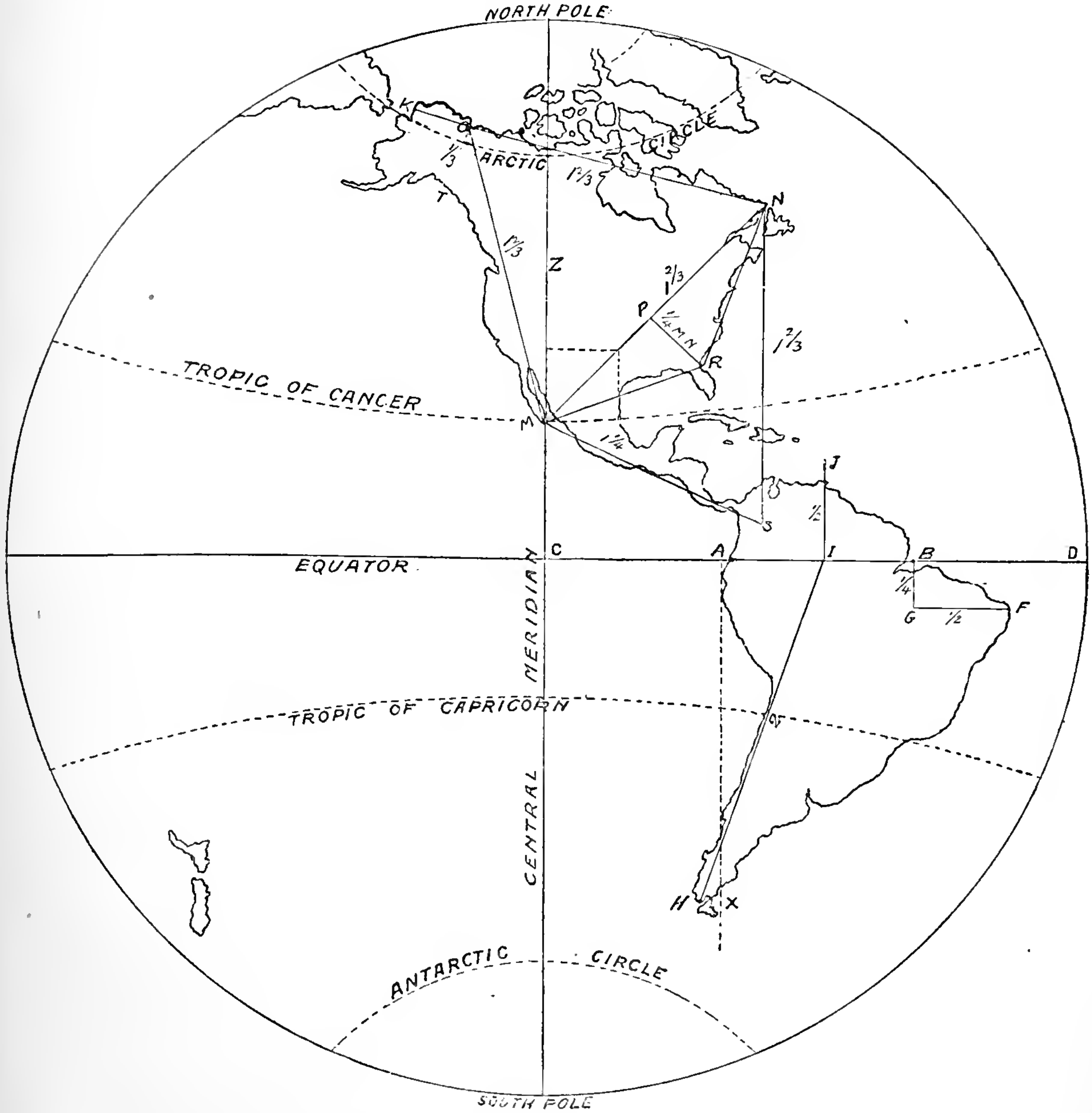
The unit of measure used in the diagrams of the Western Hemisphere is the distance across South America along the Equator. This equals (very nearly) one-third of the distance from the center of the map to the margin, or one-third of the line C D (or one-twelfth of the distance around the earth).

The diagrams are given alone and also with the continents drawn in the hemispheres (both being lettered alike); but each continent should first be drawn separately, and outside of the circle until some skill has been acquired. For this reason, the directions are given as though the continents were not in the circles.




The diagram of South America, which should be taken first, is constructed as follows:




*Key to Diagrams.*—A B (≐C A =B D) equals middle third of C D, and is unit of measure for W. Hemisphere (S. American Unit). M N ($1\frac{2}{3}$ A B) is drawn at an angle of 45° with Central Meridian (diagonal of square prolonged). P. is middle point of M N.

To find O describe intersecting arcs with M and N as centers, and the line M N as radius.

To find S use M and N as centers and radii equal to $1\frac{1}{4}$ A B and $1\frac{2}{3}$ A B, respectively. (M is at Cape San Lucas, F at Cape St. Roque, and O T is boundary of Alaska.)

Take a horizontal line A B of any convenient length and at its middle point, I, erect the perpendicular J I, equal to one-half of A B. Also draw the line I H, twice the length of A B, and so that the point H is a little to the left of a perpendicular A X, let fall from the extremity of A B (as shown in the figure).

Draw the perpendicular line B G, equal to one-fourth A B, and the horizontal line G F, equal to one-half of A B.

F represents Cape St. Roque, the most eastern point of South America. The outline of the map should now be sketched without other lines or points than those given. Observe that the northern coast of South America does not extend quite as high as I J, or half of A B.

When the map of South Amerişa is drawn in a circle observe that A B is the *middle third* of C D. The large bend in the western coast is some distance above the Tropic of Capricorn, while the bend in the eastern coast begins near that circle. Cape Horn is situated midway between the Central Meridian and the boundary circle.

## Diagram of North America.

First take a line which may represent the distance across South America along the Equator as the unit of measure. From a point, as M, which represents Cape San Lucas, draw both a perpendicular and horizontal line—the latter extending to the right; as M Z and M W. From the point M and just half way between these lines, or at an angle of 45 degrees, draw another line and extend it until it shall equal 1⅔ the unit of measure, as the line M N. (This line can be easily drawn by first constructing a square, using equal parts of the perpendicular and horizontal lines as two sides of the square, as shown in the figure by dotted lines. Then draw the diagonal of this square from the point M and extend it as far as desired.)

The line M N is one side of an *equilateral* triangle. Using M and N as centers and the line M N as a radius, describe arcs cutting each other at O. Connect O with M and N. The point O is on the boundary between Alaska and British America. At the middle point of M N drawn the line P R at right angles to it and equal to ¼ of M N.

R is just off the coast above Florida. Connect R with M and N. R M and R N are equal and only a little less that the unit of measure.

O T, the eastern boundry of Alaska, makes an angle with O N a little greater than a right angle. O T and O K (an extension of O N) are each equal to about one third of the unit of measure.

M S is equal to 1¼ of the unit of measure. N S is equal to M N and is used to locate the point S which is a little way on the mainland of South America. To find S use M as a center and with a radius equal to 1¼ times the unit of measure describe an arc; and with N as a center and M N as a radius describe another arc cutting the first at S. The map can now be drawn.

When the map is drawn in the hemishere it should be observed (1), that the southern point of lower California, *or M, is at the junction of the central Meridian and Tropic of Cancer*, (2) that the Tropic of Cancer passes between Cuba and Florida; and (3) that *A B, or distance across South America at equator, becomes the unit of measure.*

### How to Describe Circles about South America and North America when Drawn Separately and without Circles.

In South America extend A B both ways, so that the extensions, or A C and B D, shall each be equal to A B. With C as a center and C D as a raduis describe the circle required.

In North America extend the perpendicular first drawn (which is really a part of the central Meridian) below M a distance equal to $\frac{3}{4}$ of the unit of measure, or to C. With C as a center and three times the unit of measure as a radius describe the circle. (The unit of measure can always be determined, if not known, by dividing the distance M N, or M O, into five equal parts and taking a line equal to *three of these parts.* This is evident from the fact that M N is equal to $1\frac{2}{3}$ or $\frac{5}{3}$ times the unit of measure. Three of these five parts would then be equal to the unit of measure.)

The numbers on the lines of the diagrams indicate their lengths as compared with that of the South American unit, unless otherwise noted.

### Eastern Hemisphere.

In the diagrams for the Eastern Hemisphere the *distance across Africa on the Equator, or X Z, is the unit of measure. This distance equals* $1\frac{1}{7}$ *times the South American Unit and may be called the African Unit.*

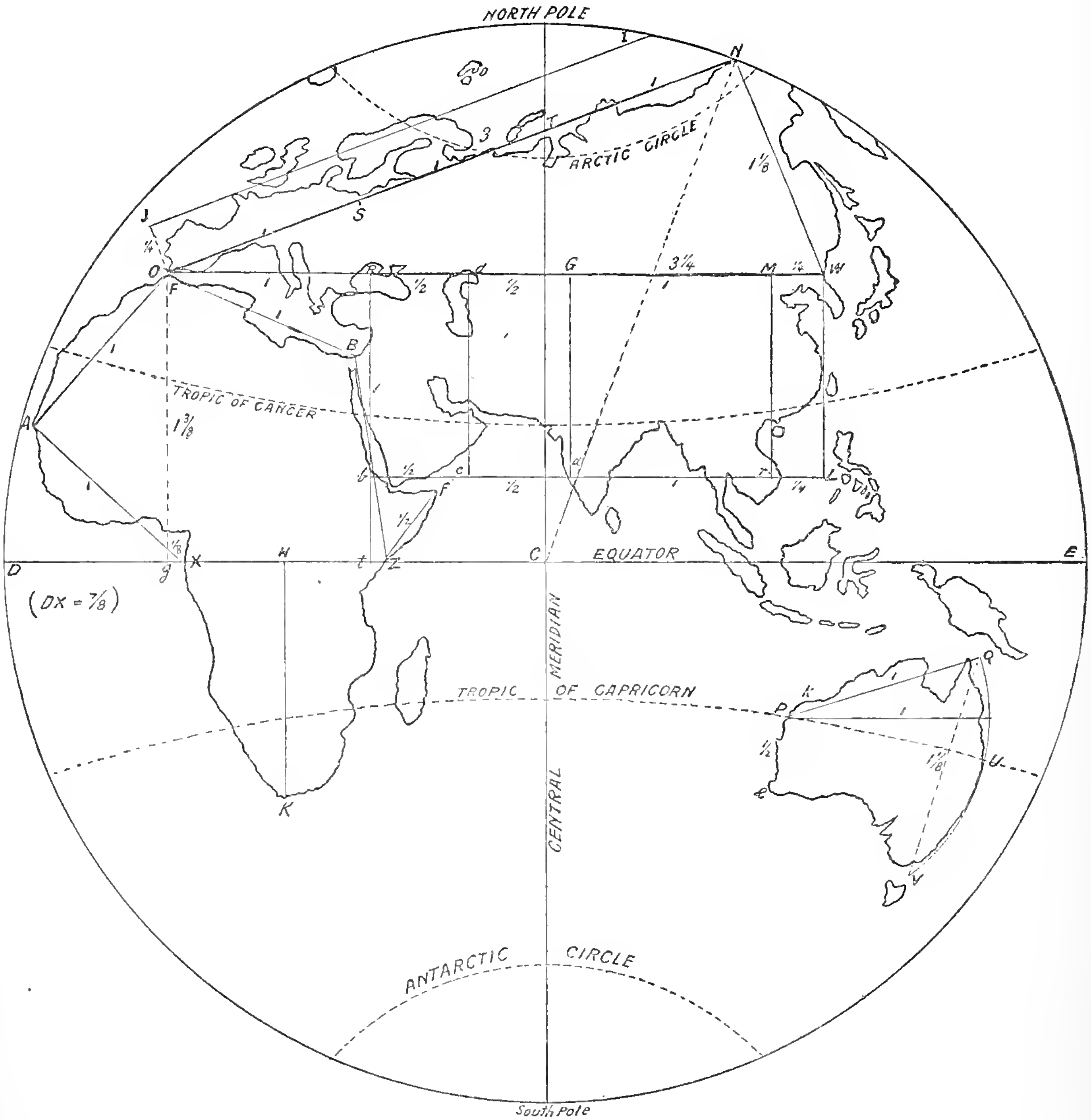
*Diagram of Africa.*—Take a horizontal line X Z of any convenient length, and from its middle point let fall the perpendicular line H K, equal to $1\frac{1}{8}$ times X Z. K represents the Cape of Good Hope. From Z draw Z f at an angle of 45 degrees and equal to a little less than half X Z.

The five lines X Z, Z B, B F, F A, and A X are all equal.

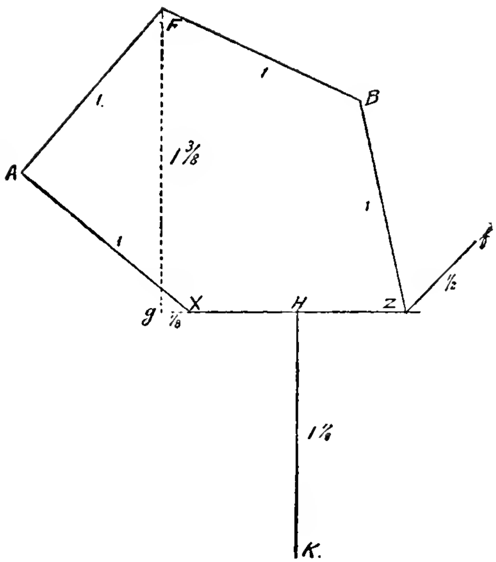
B represents the south eastern point of the Mediterranean; F, Cape Spartel—just opposite the Rock of Gibraltar; and A, Cape Verd.

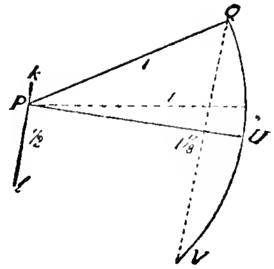
In order to draw this figure, it is first necessary to find the point F. Divide X Z into eight equal parts and take the point g at a distance to the left of X equal to one of these parts. At the point g erect a perpendicular g F equal to eleven of these parts, or $\frac{11}{8}$ of X Z. The sum of the two lines X g and g F is thus equal to $\frac{12}{8}$ or $1\frac{1}{2}$ times X Z.

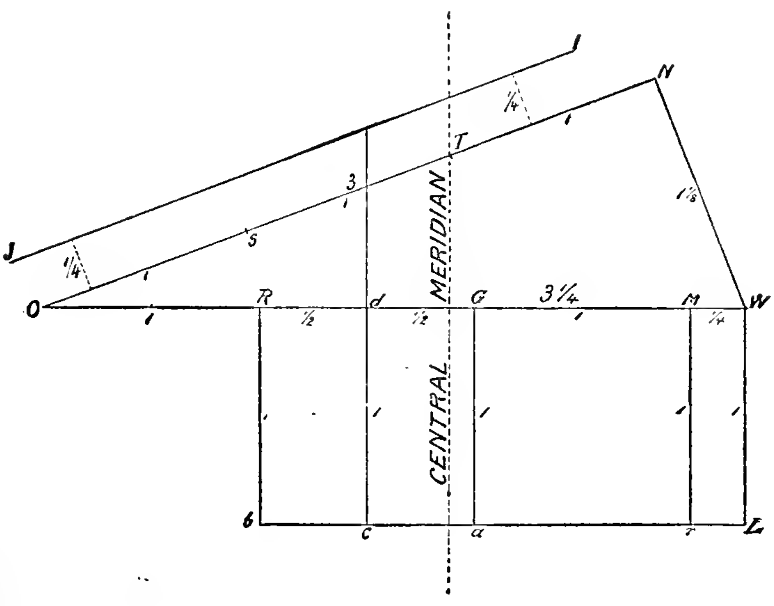
To find the points A and B use F, X and Z as centers, and X Z as a radius and draw arcs intersecting at A and B.




*Key to Diagram.*—D X=S. American Unit=$\frac{1}{3}$ D C. X Z=African Unit=$1\frac{1}{7}$ S. American Unit. To find B and A describe intersecting arcs from F, X and Z as centers, with radius equal to X Z. To find N use O and W as centers and 3 times X Z and $1\frac{1}{8}$ times X Z as radii, respectively. J I is parallel to O N.


F
1
B
1.
1 3/8
A
1
1
1/2
g
1/8
X
H
Z
1 1/8
K.


Q
k
1
P
1
1/2
1 1/8
U
V


J
N
1/4
1
T
3
1 1/8
1
S
J
1/4
1
MERIDIAN
O
R
d
G
3 1/4
M
W
1
1/2
1/2
1
1/4
CENTRAL
b
c
a
r
L

The outline of the map may now be drawn.

When the map of Africa is to be drawn in a circle observe that D X is $\frac{1}{3}$ of D C, or equal to the South American Unit; and that X Z is equal to $1\frac{1}{7}$ of this distance.

The African Unit may be changed to the South American Unit by taking away $\frac{1}{8}$ of itself. The African Unit is derived from the South American unit by adding $\frac{1}{7}$ of the South American Unit to itself.

(To divide a line into eight equal parts first divide it into two equal parts, and each of these halves into two equal parts, and then each of the quarters into two equal parts. To get the seventh of a line take a trifle more than an eighth of it.)

To describe a circle about Africa extend the line Z X to D, making X D equal to a South American Unit. Then draw D C, equal to three times this unit. From C as a center, with C D as a radius, describe the circle required.

*Diagram of Australia.*—From any point, P as a center and with a radius equal to the *African Unit*, describe the arc Q V. The line P U should fall below the horizontal as indicated in the figure. The distance Q U is equal to $\frac{1}{2}$ the African Unit, and the distance Q V is equal to H K, or the distance that Africa extends below the Equator—e K is a little less than half of the African Unit. Draw P Q. The outline of the map may now be drawn.

To draw a map of Australia in a circle it will be necessary to remember that the line P U lies along the Tropic of Capricorn, and that P marks the half way point between the Central Meridian and boundary circle.

*Diagram of Eurasia.*—Draw a horizontal line of indefinite length, and from the extremity O (representing a place just south of Cape St. Vincent) measure off a distance equal to $3\frac{1}{4}$ times the African Unit, or the line O W.

R is a point on the north west coast of the Black Sea, as indicated; and W represents Cape Brual.

To find the point N use O as a center with a radius equal to three times the the African Unit, and W as a center with a radius equal to $1\frac{1}{8}$ this unit and describe arcs. N will be the point where these arcs intersect. Draw O N and N W, and also the line I J parallel to O N and at a distance from it equal to $\frac{1}{4}$ of the African Unit.

From the points R, G, M and W let fall perpendiculars to the distance of one African Unit, and draw the line b L. Also at the middle point of R G draw the perpendicular d c, and note that this line extended determines the position of the Persian Gulf, Caspian Sea and north eastern extremity of the Scandinavian Peninsula. Corsica and Sardinia come at the middle of O R. G *a* determines the position of India. The outline of the map may now be drawn. The numbers on the lines of the diagrams indicate their lengths as compared with the *African Unit.*

To draw Eurasia in a circle, first obtain the point F, and then place the point O a little to left and above it when the line O W and rest of diagram may be drawn as before. Or, take C t equal to the *South American Unit* and at the point t erect a perpendicular t R equal to a little less than $1\frac{1}{2}$ times the African Unit. The point R being found, the diagram can be readily drawn.

How to describe a circle about the map of Eurasia: From T, the second division of O N, let fall a line perpendicular to the horizontal line O W, and extend it to C, or until the whole line T C equals $2\frac{1}{8}$ times the African Unit. As the point T is on the Central Meridian, the line T C coincides with it and the point C is the center of the circle desired. The radius of this circle is the line C N, or a line equal to three times the South American Unit.

The larger islands may be drawn more accurately by comparing their lengths with the *South American* and *African Units.*

*To the Teacher:* Pupils should have much practice in drawing these bodies of land, putting them in circles and drawing them on any scale, deriving one scale of measure from another. *After a time the diagrams should be gradually left off and the maps drawn free hand—the diagrams being retained in the memory as a basis for criticism and test of accuracy. Only excellent work should be accepted.*

Locate the following on your maps:

### Mountains.

Sierra Nevada (U. S.).
Sierra Nevada (Spain).
Coast Range.
Cascade Range.
Alleghany.
Mt. Whitney (14,900 ft.). Highest peak in U. S.
Acary.
Parime.
Cotapaxi (16,300 ft.). Most active and violent volcano in the world.

### Rivers.

Cambodia or Mekong.
Brahmaputra.
Irrawaddy.
White Nile.
Blue Nile.
Parana.
Uruguay.
Maderia.
Tapajos.
Negro, (2).
Tocantins.
Xingu.
Nelson.
Sacramento.
Ohio.
Fraser.
Saskatchewan.
Rhine (Famous for its beautiful scenery).
Cassiquiare (Forms junction between Orinoco and Amazon so a boat can pass from one to the other in the rainy season.)
Jordan and Dead Sea (Famous in sacred history. The Jordan flows into the Dead Sea which is more than 1300 feet below the sea level—the greatest depression of land in the world. The water of this sea is very salt and bitter. Why? The lake can have no outlet. Why?)
Thames (London).
Seine (Paris).
Neva (St. Petersburg).
Tiber (Rome.)
Loire.
Tagus.
Ebro.

### Cities.

Boston (Great seaport, also leather and wool market).
Hammerfest (Most northern town of Europe).

Cincinnati (Metropolis of Ohio valley).
Kansas City (Railroad center and stock market).
Portland (2). Important seaports.
Pittsburg (Iron, coal and glass).
Omaha (Railroad and trade center).
Galveston (Next to New Orleans most important Gulf port).
Denver (Metropolis of Rocky Mountain region).
Buffalo (Important lake port).
Sitka (Principal town of Alaska).
Minneapolis (Has greatest flour mills in the world).
St. Paul (Important railroad center).
Los Angeles (Metropolis of Southern California).
Montreal (Built on an island in the St. Lawrence River—metropolis of Canada. The great Victoria Railroad Bridge, one and a half miles long and sixty feet high, crosses the river).
Para (Greatest rubber market in the world).
Nizhni Novgorod (Famous for its annual fairs for sale and exchange of merchandise amounting to millions of dollars).
Jerusalem (Famous in sacred history as the great city of the Jews).
Shanghai (Important seaport).
Yokohama (Important seaport).
Genoa (Home of Columbus).
Naples (Metropolis of Italy — has a beautiful bay).
Bangkok (Called the "Floating City" on account of the large number of houses built on boats and piles).
Smyrna (Ancient seaport).
Mecca (Sacred city of Mohammed and to which all his followers are expected to make a pilgrimage sometime during their lifetime.)
Hangchow.
Winnipeg.
Milwaukee.
Vera Cruz.
Ottawa (Capital of Canada).
Quebec.
Halifax.
St. Johns.
Havana (Metropolis of Cuba—great tobacco and sugar market).
Victoria.
Bahia (Beautifully situated on bay of emerald water).
Havre (Important seaport).
Oporto (Port wine).
Malaga (Grapes and wine).
Muscat.
Zanzibar.
Venice (A beautiful city whose streets are canals).
Odessa (Great grain market).
Florence (Famous for its art galleries).
Vladivostock (Proposed terminus of the great railway across Siberia).
Tobolsk.
Irkutsk (Largest city in Siberia—great center of fur trade).
Glasgow (Ship building).
Mexico (Capital and metropolis of Mexico).
Dublin (Largest city in Ireland).
Edinburg (Has a great university and libraries).
Palermo.

Honolulu (Situated on Oahu island. It is the capital of the Sandwich Islands).
Hamburg (Next to London and Liverpool—the most important seaport in Europe).
Athens (The ancient center of Art, Poetry and Eloquence).
Aukland (Important seaport).
Damascus (Largest city of Turkey-in-Asia—over 4000 years old—Damask silk made there—famous Damascus blades of ancient times made in this city).

### Lakes.

Winnipeg.
Manitoba.
Winnepegosis.
Great Slave Lake.
Lesser Slave Lake.
The Great Lakes (Superior, Michigan, Huron, Erie, Ontario.)
Itasca (Source of Mississippi).
Maracaibo.
Titicaca (Highest large lake in America, 12,600 feet above sea).
Victoria and Albert (Source of the White Nile).
Tanganyika (Head of a branch of Congo).
Nyassa (Head of a branch of Zambezi).
Baikal.
Balkash.
Aral Sea.

### Peninsulas.

South America.
Africa.
Europe.
Iberian (Spain and Portugal).
Scandinavian (Norway and Sweden).
Indo-China (Or Farther India).
Hindustan.
Arabia.
Greece.
Balkan (All country south of line connecting northern part of Black Sea with Adriatic).
Italy.
Alaska.
Alaskan Peninsula.
Labrador.
Florida.
Jutland.
Nova Scotia.
Lower California.
Yucatan.
Kamchatka.
Malay.
Corea.
Crimea.

### Straits and Channels.

Macassar.
Torres.
Fox Channel.
Formosa Channel.
Tartary Channel or Gulf.
La Perouse.
Corea.
Molucca Passage.
Windward Passage.
Mona Passage.
Yucatan Channel.
Sangar.
Cook.
Bass.
Palk.

## Capes.

East Cape.
Prince of Wales.
Cod.
Matapan.
Romania.
Cambodia.
Bon.
Palmas.
Blanco.
Race.
Sable.
North.
North West Cape.
York.
Howe.
Corrientes.
Orange.
Frio.
Clear.
Spartivento.
Ortegal.
Lapatka.
Agulhas.

Indicate on your maps boundaries of

Oceania { Australasia. Malaysia. Melanesia. Polynesia.

Distinguish volcanic islands from coral islands by proper marks.

## Islands.

Orkney (Br.)
South Shetland.
South Orkney.
Faroe (Denmark).
Balearic (Sp.)
Elba (Italy). Residence of Napoleon for part of a year after his abdication.
Ionian (Greece).
Queen Charlotte (Br.)
Andaman (Br.)
Laccadive (Br.)
Maldive (Br.)
Banca and Billiton (Neth.) Contain richest tin mines in the world. Banca supplies the purest tin.
Juan Fernandes (Chile). On which Alexander Selkirk was wrecked aud lived for years, suggesting the story of Robinson Crusoe.
Liu Kiu (Japan).
Kurile (Japan).
Saghalen (Rus.)
Samoa or Navigator.
Fiji (Br.)
New Caledonia (Fr.)
Moluccas or Spice (Neth.)
Loyalty (Fr.)
New Hebrides (Fr.)
Solomon (Ger.)
Cook (Br.)
Admiralty (Ger.)

Formosa (Ceded to Japan by China in 1895. Produces finest tea).
Candia or Crete (Turkey).
Cyprus (Br.)
Canary (Sp.) Touched by Columbus on his voyage to America.
Ferro of Canary group (Most western land known to the ancients).
Cape Verd (Port.)
Malta (English stronghold).
Maderia (Port.)
Hebrides (Br.)
Isle of Man (Br.)
Shetland (Br.) Source of Shetland ponies.
Spitzbergen (Neth.)
Azores (Port.)
Fanning (Br.)
Society or Tahiti (Fr.)
Austral or Tubuai (Fr.)
Marshall (Ger.)
Marquesas (Fr.)
Gambier (Fr.)
Bismark Arch. (Ger.)
Socotra (Br.)
Fernando Po (Sp.)
Great Barrier Reef.
Kangaroo (Br.)
Caroline (Sp.)
Ladrone (Sp.)
Barbadoes (Br.)
Victoria Land.
Wilkes Land.
Franz Josef Land.

Mark off on your maps the countries of North America and South America, and, later, those of Europe, Asia, Africa and Australia.

Refer to the maps in your geographies for things not found in this book.

## Some Things To Remember.

Observe and remember that the large mountain ranges are generally near the edge of the continents, with their most abrupt slope on the side nearest the ocean; 2—that most of the land is in the northern hemisphere; 3—that most of the continents are triangles in form, with the small end or apex pointing south; 4—that the most civilized and progressive nations live in the North Temperate Zone.

(*To the Teacher:*—Pupils should be required to take imaginary journeys frequently to different parts of the earth—around any continent or the earth itself (in any direction) and tell about the waters and lands on or near the route, the *climate, products and people.* They should be required to stop at any point on the journey and tell the direction they are going and the direction of any other point from them, the land or water to the north, south, east or west. They should be able to coast along any shore and name the principal bays and gulfs and rivers they would come to in order.

They may take up their abode in faraway lands and write letters home telling of their journey and describing the country, products and people. The reasoning powers, imagination and expression (oral and written) should be constantly cultivated. No study offers a better field for this work than geography.

Pupils should use their regular text-book in geography constantly for reference, and should recite from it, taking it in regular order, except where it conflicts with the plan here indicated. In such case, the text-book must be subordinate to this system, if both are used, or confusion and failure will follow.)

Indicate on your maps the Trade Winds, Return Trade Winds, Calm Belts and Monsoons.

Indicate on your maps the boundaries of the following:

### Highlands and Plateaus.

Plateau of Tibet (10,000 to 18,000 ft.). Has small rainfall and but little vegetation —inhabited by scattering tribes of rude people.

Pamir Plateau (over 12,000 ft.). Called the "Roof of the World." Mountain ranges diverge from it in all directions.

Andes Plateau (8,000 to 13,000 ft.). In contrast to that of Tibet, it has frequent rains; grain and other vegetation grow well; and it is settled by an active and progressive people.

Pacific Highlands. Receives very little rainfall except on mountains and foot hills.
- Rocky Mt Plateau (6,000 ft.)
- Great Basin (5,000 ft.). A vast basin-like valley crossed by many mountain ranges. Has little rainfall and its streams have no outlet to the sea. It is generally arid and parts of it are very barren. Within this basin is "Death's Valley." Many people have perished from thirst in attempting to cross it.
- Mexican Plateau (over 7,000 ft.). Northwest portion receives but little rainfall. Some other portions are dry and barren part of the year.

Plateau of Labrador (2,000 ft.). This plateau is bleak and barren for the most part, due to the cold winds from the interior of the continent and nearness to the Arctic current.

Atlantic Highlands (2,000 ft.). The Appalachian Mountains are much older than the Rocky Mountains and were originally higher, but have been worn down to present altitude by action of water and other causes in ages past. They are mostly covered with forests. The foot hills and lower levels are very productive. Rainfall is abundant.

Hight of Land (2,000 ft.). This is believed to be the oldest land in the world, or first to rise above the water. It is the divide between the Mississippi system and Arctic system of rivers. The incline of land is very gentle each way.

Brazilian Plateau (2,500 ft.). Receives sufficient rainfall for growth of vegetation.

Highlands of Guiana (1,500 ft.). Receives abundant rainfall.

Plateau of Abyssinia (6,000 ft.). Rainfall is light in the northern or highest part of plateau, but more abundant in the southern part, where large crops are raised. Canons 3,000 to 4,000 feet deep have been cut in this plateau by rivers.

Central Table-Land of Africa (1,500 to 2,500 ft.). Across the central portion or along the Equator the rainfall is very copious and all vegetation is luxuriant. The rainfall diminishes toward the north to the Sahara Desert, and also on the south to the Desert of Kalahari.

Mongolian Plateau (2,000 to 4,000 ft.). This region has very little rainfall and vegetation. The Desert of Gobi, included in this plateau, has sufficient rainfall, especially in the eastern part, to support scanty grass and shrubs, which serve as forage to the caravans of camels which pass over it. The high mountains on all sides of this plateau deprive the atmosphere of its moisture before passing over it.

Plateau of Deccan (2,000 ft.). The southern part of this plateau is well supplied with rain. There is little rain in the northern part, however, and droughts are common. Irrigation is necessary to the raising of crops here as well as in many other parts.

Plateau of Asia Minor and Iran (5,000 ft.). The rainfall is light and part of this section is a desert.

Arabian Plateau (5,000 ft.). Nearly all of the central portion is barren. The productive portions are along the coast and in the valley of the Euphrates and Tigris, where irrigated.

Scandinavian Plateau (2,000 to 5,000 ft.) and

Highlands of Central and Southern Europe (800 to 2,000 ft.). Rainfall is abundant on these two plateaus.

Spanish Plateau (2,500 ft.). The rainfall is so slight on large portions of this plateau few trees and little vegetation grow.

## Lowlands.

As a rule all plains on the coast receive abundant rainfall, but there are some notable exceptions. Name two.

Low Plains of Europe. Most of the northern portion of Europe, except Norway and Sweden, is a low plain, well watered and very productive. The valley of the Po is made up of alluvial soil and is very fertile, but requires irrigation to produce crops.

Siberia, Steppes. The Steppes where rainfall is sufficient produce abundant crops of wheat and other grain. The central plain of Siberia is dry and produces but little vegetation. It is settled chiefly by nomadic people.

India. The plains of the Indus and Ganges are extensive and very fertile. The upper portion receives an immense rainfall from the summer Monsoons, but the lower valleys require irrigation. The costal plains are fertile and well watered, but unhealthy.

Turkistan. The plains of Turkistan and those about the Caspian and Aral Seas are almost barren on account of the little rainfall. This region is inhabited by nomadic people.

China. The great plain of China is made up of the alluvial soil brought down by the Yellow and Yang-tse rivers, principally by the former and is exceedingly fertile and well watered. This plain supports more than a hundred million people. The Yellow River gets its name from the yellow soil which it brings down from the upper regions. It colors the sea for some distance. The Yellow River is shallow and is hardly navigable, while the Yang-tse is navigable for over a thousand miles.

Babylonia or Valley of the Euphrates and Tigris. The soil of this valley is very fertile but crops can be raised only by irrigation.

Africa. Africa is almost wholly a plateau. It has a narrow costal plain and low plains near Tchad and in the lower Nile valley. The Niger has the largest delta and the Congo the largest volume of water.

Australia. Central Australia is a dry arid plain for most of the year. Rains are uncertain.

North America. The principal plains of North America are the Gulf plain, Atlantic coast, valleys of the Mississippi, St. Lawrence and Mackenzie. The Gulf Plain, Atlantic Coast and Mississippi valley are well watered and very productive. The Pacific coast is bold and hilly for the most part. It is well watered from northern California to Bering Sea. Lower California has little rainfall and requires irrigation to grow crops.

South America. The Llanos of the Orinoco, Selvas of the Amazon, Pampas of La Plata and Coastal Plain. The Llanos and Pampas are very similar, in that they are both deserts a portion of the year and at another part of the year have abundance of rain and are covered with nutritious grasses on which large herds of cattle fatten. The grass of the Pampas is very tall and called Pampas Grass. Large herds of wild cattle and horses graze on the Pampas and are caught by the lasso. The Selvas, the vast forest plains of the Amazon, have large rainfall.

Swamps. Everglades of Florida. Dismal Swamp.

Marshes of Pinsk. Mississippi Delta.

Tundras of Siberia, Europe and North America. The Tundras are low level plains on the northern border of these countries. They are frozen many feet deep most of the year, but during the short summer the surface thaws to a shallow depth when lichens and moss, the food of the reindeer, flourish. In the spring the Mackenzie, Obi, Lena, Yenisei and other Arctic rivers, being blocked at the north with ice, overflow and cover vast tracts with water. The Tundras which are almost impassable in summer are readily traversed in winter. Large herds of American reindeer, called Caribou, feed on the plains west and north of Hudson Bay. The Tundras are the home of the reindeer. They are sparsely inhabited. South of the Tundras are the forest plains.

Draw on your maps lines representing limits of Wheat, Snow, Trees and Icebergs.

The Climatic Zones of the northern hemisphere differ somewhat from those of the southern hemisphere. Why?

Draw the Isotherms for every 20 degrees Fahrenheit upon your maps. Account for the abrupt changes in direction of the Isotherms as far as you can.

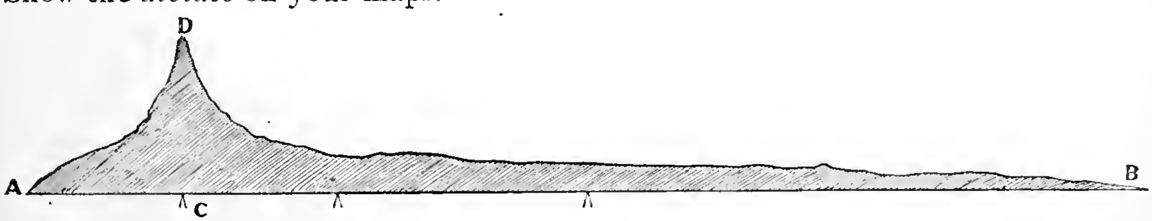
## Relief Maps.

From your knowledge of the continents—their rivers, mountains, highlands and lowlands—you will be able to make relief maps of them.

We know that the Amazon river flows east. What does this tell us of the slope of the country through which it flows? We know first that the whole of the basin of the Amazon must slope east. This is the *principal* slope. Tributaries come to the Amazon from the north and south. This tells us that the land on the north slopes south, and that on the south slopes north; or as the great slope is east, these slopes are southeast and northeast. Then each of these rivers have other rivers running into them from each side, so we have other slopes. Learn and remember the comparative hights of the principal mountains and plateaus.

Represent the relief forms in light and shade, or in colors, as follows:—

Indicate the lowlands by green; the tops of high mountains by white to represent snow; deserts by yellow; and high plateaus and plains by some dull color. Remember to analyze the slopes of each river basin, as we have that of the Amazon and indicate these slopes on the map. Show the abrupt mountain slope on the side next the ocean and the gentler slopes on the side next to the main body of land. Show the *divides* on your maps.




The above figure represents a cross section of South America on the Equator. Its length, A B, therefore, represents a distance of about 2,000 miles. The distance C D (equal to A C), representing the altitude of cross section, is about ⅛ of A B, or 250 miles. As the Andes Mountains at this point are only about 4 miles high the section is exaggerated about 60 times (250÷4).

Make cross sections of the different countries in all directions. Estimate amount of exaggeration in these cross sections, by comparing indicated heights with length of sections. Amount of exaggeration should be estimated and marked on each cross section. (See figure on previous page.)

Indicate on your maps the amount of rainfall of the different parts of the earth.

## How to Draw the Parallels for Every Ten Degrees.

From each end of the Equator as a center, and with one-half of the Equator as a radius, describe arcs cutting the boundary circles of the Hemispere in four places, two north of the Equator and two south of it. These points will be just thirty degrees from the Poles, or one-third of the distance from the Poles to the Equator.

Now divide one of these parts (of thirty degrees) into three equal parts of ten degrees each and use one of them as the unit of measure with which to divide up the boundary circle.

Divide half the central Meridian into three equal parts, and one of these parts into three equal parts again. Use one of these smaller divisions as the unit of measure with which to divide up the whole of the central Meridian.

Pass curved lines through the points in the central Meridian and the corresponding points of the boundary circle. Mark these parallels with the proper number of degrees from the Equator.

Remember that all places on the Equator have no latitude, or their latitude is zero, and all other places are either in *north* latitude or *south* latitude.

All places except the poles have a latitude of less than ninety degrees.

Practice in drawing and reading these circles.

## How to Draw Meridians of Longitude for Every Ten Degrees.

Divide the Equator into the same number of parts and in the same manner as the central Meridian was divided for parallels, and connect the poles and each of these divisions with lines of uniform curvature. Mark these meridians with the degrees belonging to them.

Remember that the margins of the maps of the Eastern and Western Hemispheres are identical (the Eastern margin of the Western Hemisphere and the Western margin of the Eastern Hemisphere, being each 20 degrees, and the other margins being each 160 degrees). Why? Remember the number of degrees of the central meridians of both Hemispheres.

After some practice in drawing and reading meridians of longitude, draw a circle using both parallels and meridians at the same time.

Next draw the parallels and meridians on a hemisphere map which has already been completed, and test the accuracy of your drawing by comparing latitude and longitude of places on your map with those in the book.

Under no circumstances should the parallels and meridians be drawn before the map is fully completed. No changes or corrections should be made after these lines have been put in. These lines must not be used as guides in map drawing. They are to be used as tests of accuracy of work and for drill in finding latitude and longitude of places.

If required to find the latitude and longitude of places, a hemisphere map should first be carefully drawn, showing these places and then the meridians and parallels drawn on this map.

(*To the Teacher:* The pupil should now mark off the different countries of the world, *as far as possible, on the hemisphere maps,* in order to fix their comparative size in the mind. To make this work of still greater value, a few of the states, such as Florida, Texas, California, New York, should be marked off at same time.

It will be necessary at first for the pupil to practice marking off the countries on enlarged maps of the separate Grand Divisions, especially Eurasia, outside of the hemisphere.

The Grand Divisions and Countries may now be taken up separately and studied in detail.

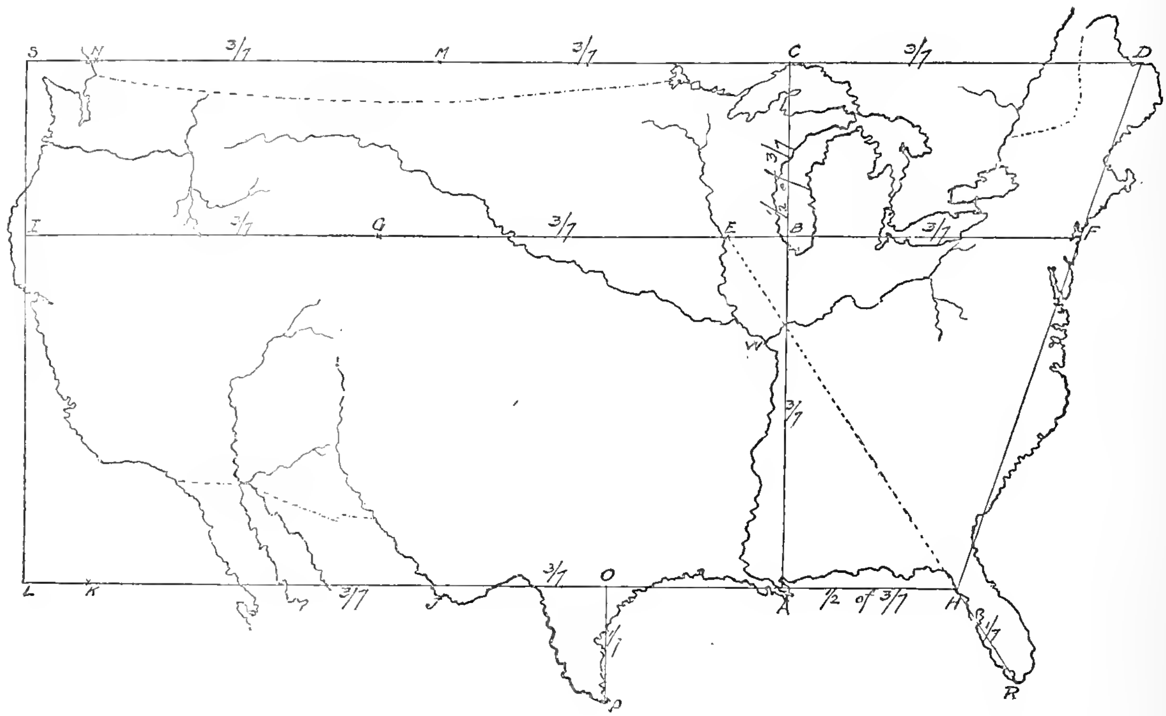
For this work, the country or Grand Division to be studied should be enlarged or "magnified" from the hemisphere map, and all details, as rivers, mountains, bays, cities, etc., added as desired. The pupil can find these details represented on the maps in his geography, and should take them from these. The work may thus be carried on as far as the teacher desires.

The pupil should be able to sketch off any Grand Division quickly and accurately, and on any scale.

The countries and all larger divisions of land should be considered by the pupil (in study and recitation) in reference to, first, *location;* second, *size* (comparative); third, *form;* fourth, *coast line* (amount and value); fifth, *surface;* sixth, *drainage;* seventh, *latitude;* eighth, *climate* (*temperature, rainfall, etc.*); ninth, *forests and other natural resources;* tenth, *products* (animal, vegetable and mineral); eleventh, *people* (occupations, government, religion, customs, etc.).

### Diagram for Drawing Map of the United States.

For closer study and detail work the map of the United States may be enlarged from that of North America, as is done with other countries. However, on account of the greater importance of our own country to us and the desirability of having as accurate a map of it as possible, it may be found of advantage to construct the map first from a diagram.




Take for the unit of measure a line about one-third the length desired for the map east and west, usually some multiple of the scale used when it forms a part of North America. This line should be equal to about $\frac{3}{7}$ of the *South American Unit, of same scale.*

Draw the perpendicular line A B equal to this unit of measure. (B is a point near Chicago and A, a point on the coast of the Mississippi delta below New Orleans.) Extend A B to C, making B C equal to ½ of A B. (C represents a point on the northern bend of Lake Superior.) Draw horizontal lines through C, B and A. On the horizontal line through C take C D, C M and M N, each equal to A B. (D represents a point in Maine north of Schoodic Lake, the source of the St. Croix River—a portion of the boundary of Maine.)

On the horizontal line through A take the line A H (equal to ½ of A B), and A J and J K, each equal to A B. (The point H is on the western coast of Florida, and J is a point on the Rio Grande—the boundary river between Texas and Mexico.)

Connect D and H. From the point F, where the horizontal line through B meets D H, measure off F E, E G and G I, each equal to A B. (F represents New York, and E the bend in the Mississippi west of Chicago.)

Draw the perpendicular line S L through I. At the middle point of A J let fall the perpendicular line O P, equal to ⅓ of A B. Also draw H R, in the direction of a line passing through E and H, and equal to ⅓ of A B. (P represents, approximately, the southern point of Texas; and R, of Florida.)

The outline of the map may now be drawn.

Considerable practice should be given in drawing the Atlantic coast before marking off the states. The Atlantic States should be drawn first, and then the states bordering on them, etc. Each state should be marked off, and may be drawn separately on enlarged scale. Practice in giving distances from one point to another, also in estimating the size of maps of South America and North America drawn on this scale. Relief maps of whole, and sections of United States should be drawn.

The fractions connected with the lines in the diagram represent the length of these lines as compared with the South American Unit of the same scale.

(*To the Teacher:* Much attention should be given to drawing cross-sections of countries, and especially of the United States, using the sea level as the base line. Of course, the altitudes of mountains, plateaus, plains and lakes must be learned in order to do this. Cross-sections of the United States running east and west at about 40° and 30° north latitude would be profitable exercises. Pupils should be required to represent the cross-sections well and also to discuss them.

There should also be considerable time given to map-reading from north to south and from east to west. For instance, begin with Wisconsin and tell about climate, products, etc., and then of Illinois and Kentucky, and so on. Begin with Washington and read down the Pacific coast. Begin with New York and read westward. This brings the cross-sections into intelligible comprehension and puts into *effects* or *results* the facts of elevation and latitude upon climate, rainfall, productions, etc.)

## How to Find Distances in Miles Between Places on the Hemisphere Map.

The hemisphere map, representing one-half of the earth's surface, is about 12,400 miles across (one-half of the circumference, or one-half of 25,000 miles), either along the Equator from Pole to Pole or in any other direction through the center of the map. Half of the distance across is something over 6,000 miles (about 6,200 miles). Estimating in this way, we find the distance across South America on the Equator to be about 2,000 miles (one-sixth of the Equator of the hemisphere map, or one-third of half of it).

Using this distance across America (as well as any portion of the Equator) as a unit of measure, practice in finding distances between other places until you can *estimate* (not measure) distances quite readily and accurately. Distances may also be estimated quite accurately by comparing construction lines. Practice both methods.

## Another Method for Finding Distances Between Places on Hemisphere Maps in Miles.

As the distance around the earth is about 25,000 miles, one degree of latitude would equal 25,000 miles divided by 360, or a little over 69 miles; and a minute of latitude, about $1\frac{1}{7}$ miles.

As all the parallels are nearly the same distance apart, a degree of latitude is of about the same length everywhere.

A degree of longitude at the Equator is of the same length as a degree of latitude, but it constantly diminishes as the meridians approach each other, until, at the poles, it is nothing.

From this we see that the distance between places can easily be determined in miles. If they are situated on the same meridian, and the difference in latitude is known, we simply multiply the number of degrees by 69. The result will give the distance in miles between the places. From this data, and considering the length of a degree of longitude as compared with that of a degree of latitude at the same point, we can also estimate what the difference in longitude between places would equal in miles.

Practice much in finding approximate distances between places by all methods. The first method is best for rapid work and is of great value in giving comparative size, relative distance, etc.

All distances measured on direct lines towards center of hemisphere map are correct, but only approximate when measured in other directions, and especially as the margin of the map is approached. The amount of exaggeration at the margin is over one-half in the direction of the boundary circle.

This can be readily understood from the following illustration. Cut the rind of half an orange into equal parts radiating from (and attached to) the common center. Spread the rind thus cut on some plane surface and observe that the boundary is a circle whose diameter, in any direction, is just equal to one-half of the circumference of the orange; that the central portion represents well the original surface, and that the radiating pieces spread farther and farther apart until, at the end, the space between any two is more than half the distance across one of the parts.

The exact relation is determined by comparing the diameter with half of the outer boundary circle. (These were equal before the orange was cut.)

This relation is as one to one and fifty-seven-hundredths.

From this we learn that distances between all places in direct line to the center of our hemisphere map are correctly represented; that the greatest exaggeration is near the margin and in the direction of the outer boundary circle, where it is over one-half; that in a direction just half way between these two the exaggeration is one-half of one-half, or one-fourth; that all exaggeration constantly diminishes from margin towards the center, where it is nothing.

NOTE.—In order to restore a thing which has been increased one-half of itself (as hemisphere map at margin) to its original or proper size, *one-third* of it (in line of exaggeration if a map) should be deducted; and where exaggerated one-fourth of itself, one-fifth should be deducted. A simple way to illustrate the principle is this: Divide a line into two equal parts. Now, increase this by one of these parts (one-half of original line). There will now be three parts. One-third of this line (or one part) must be deducted to obtain the original line.

A little study and drill in this work will enable one to make all necessary allowances for exaggeration at margin of map, and to give distances between all places with promptness and reasonable accuracy.

### How to Find the Scale of any Map.

1. Multiply the number of degrees that an inch of the map covers in latitude (or equivalent) by 69. 2. Find the distance in inches between two places on the given map and compare this distance with the known distance between the same places on the *hemisphere map.*

### Longitude and Time.

As the earth rotates on its axis, the sun appears to pass around the earth in a day, or to pass through 360 degrees in twenty-four hours. Therefore, 360 divided by 24 equals the number of degrees passed over by the sun each hour, or 15 degrees. We see from this that we can change longitude into time by dividing by 15; and time into longitude by multiplying by 15.

The longitude between two places is 45 degrees; what is the difference in time? The difference in time between two places is 2½ hours; what is the difference in longitude?

A certain place is 20 degrees west longitude and another place is 40 degrees east longitude; what is the difference in time?

When it is 9:00 o'clock A. M. in New York, what is the time 30 degrees farther east? 22½ degrees farther west?

### How to Find the Latitude and Longitude of a Place on the Earth.

*Latitude.*—The North Star always appears to remain stationary, neither rising nor setting as most other stars do. The stars near the North Star appear to circle about it, while those farther away rise and set every night.

The reason for this is that the axis of the earth points to the North Star and makes all things appear as they would if the axis really rested upon it while the earth rotated.

Notice the position of "The Dipper" in relation to this star at different hours of the night.

Were we at the Equator, the North Star would appear as just on the horizon. As we proceeded north, it would appear to rise until we had reached the North Pole, when it would be directly overhead. That is, while we have been going ninety degrees on the earth, the star appeared to rise ninety degrees, or to rise a degree for every degree we went north from the Equator. From this we see that the altitude of the North Star, or number of degrees it is above the horizon at any place, represents the latitude of that place.

The North Star is not visible in the Southern Hemisphere. Why?

Another star visible in that hemisphere is, therefore, selected as a guide.

Latitude is also determined by noting the position of the sun and other heavenly bodies at certain hours.

*Longitude.*—If one carried a watch that kept accurate time, he could find the longitude of any place exactly. He need only set his watch at Greenwich time and carry it to the place whose longitude is wanted. The difference of the time of the place and his watch is the difference of time between that place and Greenwich. He has simply to multiply this time by 15 to get the longitude of the place. If the watch was *faster* than the time of the place, the longitude would be *west* of Greenwich; if *slower*, it would be *east* of it.

Sailors carry very accurate clocks called *chronometers*, which keep Greenwich time usually. This time is compared with the local time of the place where the ship is each day. The local time of a place may be determined by the rising and setting of the sun or other heavenly bodies.

## Standard Time.

The fact that all places not on the same meridian have different times formerly led to much difficulty and danger in running railway trains, as well as to the annoyance and confusion of passengers. Frequently the different trains of the railroads entering a city would be run on different times. To obviate these difficulties, the great railway lines of the United States and Canada, in 1883, established time divisions of the country, each division extending over 15 degrees of longitude, and known as Eastern Time, Central Time, Mountain Time and Pacific Time.

The meridians of *75 degrees*, *90 degrees*, *105 degrees* and *120 degrees*, respectively, were determined upon as the *central lines of these time divisions*. It was also determined that the local time of each of these meridians should be the *standard time* of all railroad clocks and watches in this time division. In this way, the difference in time between any two adjacent divisions would be just one hour, and no clock or watch keeping standard time would vary more than half an hour from correct local time.

Passengers traveling from one time division to another set their watches one hour back or forward, according as they go West or East.

Though standard time was originally devised for the convenience of the railroads, it is now in very general use by all classes.

See a Standard Time chart of United States.

## The Mercator Maps or Charts.

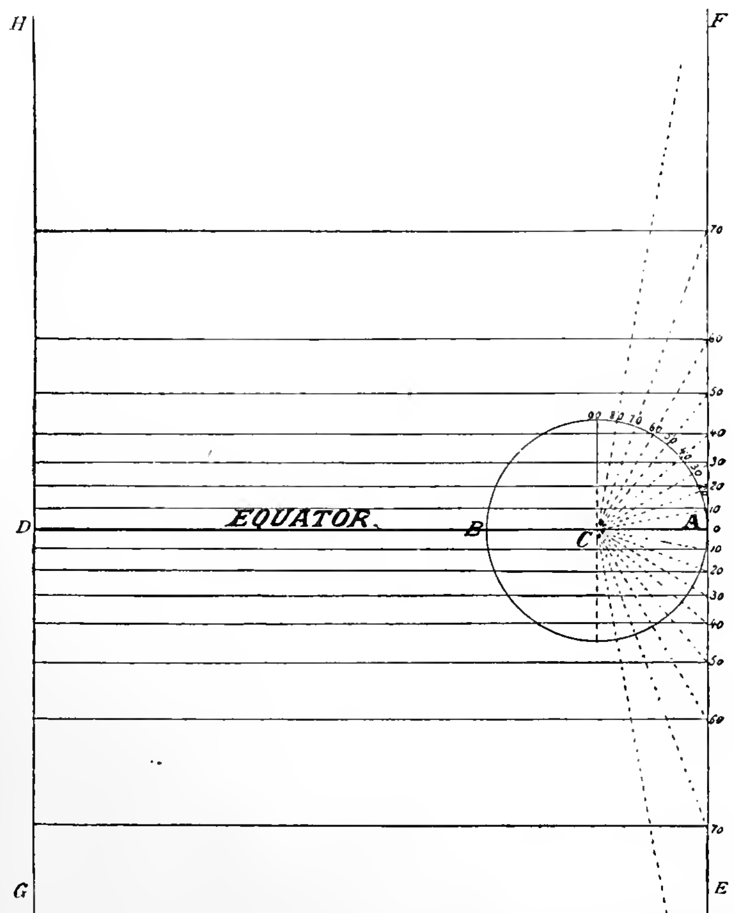
Most of our maps thus far have been drawn on a globular projection. That is, as though they formed a part of the surface of a globe.

Many maps are drawn on what is called Mercator's Projection. These maps are drawn as though the earth was a cylinder. The meridians and parallels are straight lines. The meridians are everywhere the same distance apart and the parallels get farther and farther apart as they recede from the Equator. This tends to greatly exaggerate the polar region. Indeed, the poles are not points toward which the meridians converge as in the hemisphere maps, but are circles just as large as the Equator.

The special value of this form of map is for use of sailors, and to show the whole earth at one view. As the direction of one place from that of another is always correctly shown, sailors prefer to use these maps as guides.

Kauffman is the name of the man who first employed this method of map making. Kauffman is also the German word for *merchant*. The Latin word for merchant, or *Mercator*, is the name now generally used for this kind of map.

Maps of this character are usually called charts.



## How To Draw a Map on the Mercator Projection.

(SEE FIGURE ON PREVIOUS PAGE.)

Draw a circle such that its diameter, as A B in the figure, is equal to about one third of the width of the proposed map. Extend A B to D, making A D equal to 3$\frac{1}{7}$ times A B. This line, A B, is the Equator. At one extremity, A, of the diameter, draw a line F E, tangent to the circle, or perpendicular to this diameter. At D, draw the line H G perpendicular to A D. Divide the half circumference next to the line F E into parts of 10 degrees each, or as small as desired—90 degrees on each side of the Equator, same as on hemisphere map. Through centre of circle and these divisions, up to 70 degrees, draw lines to this tangent line. Through the points in the tangent line, thus made, draw lines parallel to the diameter, and extend them to H G. These are the parallels of latitude and should be numbered in degrees the same as on the circle from which they are derived. Divide up the line A D, or the Equator, into 36 equal parts of 10 degrees each, or into any other desired number of equal parts. Through these points draw lines perpendicular to the parallels—meridians of longitude—and number them both ways from any line or meridian taken as the Prime Meridian. The sum of the degrees should be equal to 360. H G and F E being identical meridians, should be numbered alike.

Indicate on this map the exact latitude and longitude of the principal points of the continents and islands as shown on the hemisphere maps. The map is then drawn by connecting these points with the proper outline.

The view may be changed by taking any other line as the *Prime Meridian.*

Latitude of over 70 degrees cannot be represented on this map without greatly lengthening the map. In most maps on this projection, the distances between the parallels of higher latitude are arbitrarily shortened to accommodate the page on which the map is drawn, or size of map required.

Note.—The principle of the Mercator Projection may be shown as follows: Enclose a globe representing the earth in a paper cylinder. Now, if lines be drawn from the center of the globe through the different parallels to this enclosing cylinder, the ends of these lines will form circles around the cylinder. The meridians are projected on to the cylinder in straight lines, and the same distance apart as at the Equator. The distance around the cylinder would equal the circumference of the globe, or about 3$\frac{1}{7}$ times its diameter. Now, if this cylinder was unrolled, the meridians and parallels would be straight lines perpendicular to each other and would be a duplicate of the drawing already made—providing the diameters of the globe and circle were equal.

# LIFE AND PRODUCTS OF THE EARTH.

Man cannot live upon atmosphere and water, or on rocks and soils. "Life evermore is fed by life," and the earth was not fitted for man's happy dwelling-place till clothed with plants, and the waters and land were filled with animal life.

Those living objects about us that grow from the soil, remain fixed by their roots in one place and send forth their stems and branches, their leaves, flowers and fruits, are *plants,* and all of them comprise the *vegetable kingdom.*

Those other living objects that breathe the air or live in water, move about by their own effort and take the food of their choice, are *animals*, and all of them comprise the *animal kingdom.*

Man uses many of these for food, or builds homes, mills, factories, railways and ships from them. Whatever he gets from minerals, plants or animals for his use and trade he calls *products*, whether it be gold or iron, lumber, food or clothing.

To know geography as we should we must learn where and how many of these products are obtained and of their value to man.

Every part of the earth furnishes some of these and is connected by highways of land and sea with every other part. Every one of us depends greatly on what some other land and people furnish to us and what we can trade to them.

If you were asked what plant is of most use to man, many of you in the north would say wheat or corn; while boys and girls in the south would name cotton. Those in Brazil would surely mention coffee, and those in Germany and France might properly say the sugar beet. The Arab children would all at once name the date palm, the Chinese and Japanese and many others, rice or tea, and in the South Sea Islands, bread fruit would claim their votes.

If all the people of the world were asked at once, the most would answer that rice and cotton were above all others in value. To the largest number rice is the chief food and cotton clothes more people than any other thing. So by study we might learn which animal is the most valuable to man, and which mineral. But man is enabled to enjoy the blessings of all these products by trade and exchange.

The plants you daily see are not alike, but have different sizes, forms, flowers and fruits. You can find many that are similar in their nature and qualities. The science that treats of plants, how they grow, how they are related to one another in natural qualities, which tells where they are distributed in the earth, and that describes and classifies them is called *botany*. The science, or study, which similarly describes and classifies animals is called *zoology*.

We can study but little of these now, but we can learn much that is useful. They may be studied easily at home where there is a *will* to do it. It makes life far more enjoyable to learn the secrets of nature; and it is profitable to all to do so.

### Plants and Animals Necessary to Each Other.

Without plants animals could not exist. The ground contains all the elements which compose the bodies of animals, but these cannot be obtained directly. Plants must first take them out of the soil and fit them for food. Not all animals, however, get their sustenance entirely from plants. Some animals seem necessary to change plant life into food suited to other animals. The cow, for instauce, eats grass (a substance on which man and many animals would starve) and converts it into milk, butter, and flesh—most valuable foods.

In another way plants are very useful to animals. In the sunlight their leaves, which serve as lungs, absorb the poisonous carbonic acid which animals breathe out, and give back the life-sustaining oxygen.

Even marine plants absorb carbonic acid from the water and give off oxygen, which helps the fish to live and also purifies the water by destroying the decaying animal and vegetable matter.

Indeed, in this respect, plants and animals are very useful to each other. Plants need for life the carbonic acid which animals exhale, and animals need the oxygen given off by the plants.

### The Seasons.

The Earth makes a great journey around the Sun, called a *revolution*, in 365¼ days, or one *year*.

While this journey is being made, the rays of the sun fall at times more directly upon some portions of the earth than upon others, and thus bring about the change from spring to summer, autumn and winter, or the *Change of Seasons.*

You can readily understand this if you will observe the position the sun occupies at different times of the day and year, and the effects on the temperature.

When the sun is low in the sky of a morning or evening of a summer day, the air feels much cooler than at noon when the sun is high. That is, the sun will give more heat when its rays fall vertically or nearly so, than when they fall slantingly. This is because a number of vertical rays covers less space on the surface of the earth than the same number of slanting rays.

(The instrument which measures the heat or tells how hot or cold it is at any place is called a *Thermometer*. It consists of a sealed glass tube with a bulb at one end, which is filled with mercury. The air has first been taken out of the tube. When the weather is warm, the mercury expands and rises in the tube. The warmer it is, the more the mercury expands and rises. A scale at the back of the tube, marked off in degrees, tells how much it rises, and therefore, how warm it is.)

Now, if you will notice in winter time, the sun seems to pass across the sky very low down in the south, and the rays are very slanting; then, as there is but little of the sky to pass over, the sun does it quickly and so we get but little heat, with a short day and long night.

In summer the sun passes across the heavens higher up, nearly over-head, so we get much more heat and light, and the days become longer and the nights shorter.

As fall and winter come on, the sun passes across the sky lower and lower down each day, until finally its lowest point is reached, and it is Winter. Then it gradually makes the journey back again. On the journey down, the days get shorter and shorter and the nights longer, until, when the sun is half way down, the days and nights are of the same length everywhere on the earth, and it is our Fall. From this point the days are shorter than the nights and keep growing shorter, until the sun reaches its lowest point. On the return the days grow longer and the nights shorter, until, at the half way point, they are again of equal length and it is our Spring. The days continue to grow longer until the sun has reached its highest point north, and it is our Summer once more.

### The Solstices and Equinoxes.

The sun seems to stand still for a time at its highest point and lowest point, before going back on its journey, and for this reason these places are called *Solstices* (sun standing.)

The highest point is called the *Summer Solstice;* and the lowest, the *Winter Solstice*. The point just half-way between these, on the upward or downward journey, is called the *Equinox* (equal nights), as the nights and days are then of equal length everywhere. The half-way point on the *downward* journey is called the *Autumnal Equinox*, and the half-way point on the *upward* journey is called the *Vernal Equinox*, for these occur in the early part of the Fall and Spring.

We must remember that the sun does not really move at all as it appears to do. Its apparent motion north and south is due to the earth's axis being inclined and always pointing in the same direction, so that on its great journey around the sun, more of the northern side is presented to the sun and then more of the southern side at different seasons of the year.

### The Zones.

Now on this apparent journey north and south, back and forth, the sun is directly over a belt around the earth, on which it shines full and strong all the year, making it always summer. This belt extends on each side of the Equator, and is called the *Torrid* (burning) Zone. Here plants are ever green and flowers in bloom, and many kinds of delicious fruits and rare spices grow. Here live the largest and fiercest of wild animals. Man gets his food without much effort. It is so warm he needs little clothing or shelter and he becomes languid and indolent.

On each side of the Torrid Zone is a belt where the sun's rays strike slantingly all the time, and at some portions of the year much more so than at others, thus producing the change of seasons, as we have learned.

These belts are called the *Temperate Zones*. The one on the North is called the *North Temperate Zone*, and the one on the South, the *South Temperate Zone*.

In these Zones grow most of the corn, wheat and common fruits, and here are found the sheep, horse and cow.

Here live the most civilized people in the world, and here are seen the grandest works of man—the great cities, churches and schools, libraries, factories and railways.

The Frozen Regions are around the Poles. The one around the North Pole is called the *North Frigid Zone*, and the one around the South Pole, the *South Frigid Zone*. In the Frigid Zones the sun is entirely out of sight a portion of every year, and when it does shine its rays are more slanting than they are in the Temperate Zones, so that there is little light and heat compared with what we receive.

The people of these regions receive much light during their long nights from the *Aurora*—brilliant lights which shoot high in the heavens and often cover the whole sky. The name given to these lights in the northern regions is *Aurora Borealis*, or *Northern Lights*; and in the southern regions, *Aurora Australis*, or *Southern Lights*.

The vegetation of these regions is very scanty, and consists mostly of lichens and mosses, and a few other hardy plants.

The sea is full of life, but there are few land animals, except birds, which are numerous in summer.

Animals which furnish the most valuable furs, such as the Seal, Ermine, Sable, and Polar Fox, are found here; also the Eider Duck, which is covered with the soft, warm down so highly prized.

The inhabitants are stunted in growth and look like dwarfs. They dress in thick furs and live in houses made of rocks, and often of snow and ice. Their food consists of fish, the flesh of the White Bear, the Reindeer, and the Seal. They are drawn from place to place over the ice by means of Dogs or Reindeer hitched to sledges.

### Some of the Principal Plants and Animals of the Zones.

The principal animals of the Frigid Zones are the Whale, Walrus, Seal, White Bear, Reindeer, Wolf, Ermine, Sable, Polar Fox, Eider Duck and Penguin.

OF THE TORRID ZONE.

*Plants*—Palms (date, cocoanut, sago,) Pineapple, Banana, Bread-fruit, Fig, Orange, Tree-fern, Banyan Tree, Mahogany, Rosewood, India Rubber Tree, Bamboo, Ebony, Coffee, Spices, Sugar-cane, Cotton, Rice. The Banana, Cocoanut, Bread-fruit and Rice are the great foods of the tropics and grow almost everywhere in those regions.

*Animals*—Elephant, Rhinoceros, Hippopotamus, Hyena, Giraffe, Camel, Monkey, Crocodile, Ostrich, Condor, Flamingo, and many birds of beautiful plumage. The animals are mostly wild and ferocious.

OF THE TEMPERATE ZONES.

*Plants*—Walnut, Oak, Pine, Hemlock, Spruce and other trees; Wheat, Oats, Corn, Rye, and other grains; Cotton, Sugar-cane, Tea, Rice, Tobacco, Grapes, Apples, Pears, Peaches, Plums, Berries, etc.

*Animals*—Bear, Panther, Wolf, Buffalo, Bison, Deer, Fox, Kangaroo, Duck-Bill, Zebra, Horses, Cattle, Sheep, Swine, Mules, Dogs, Eagles, Turkeys, Hens, Ducks, Swans, Geese. The domestic animals are the most common.

Learn all you can about these plants and animals, how they live and what they are good for.

CLIMATE.

The kind of weather that prevails in a country, whether hot or cold, wet or dry, is called its *Climate*.

The Torrid Zone has a hot climate, the Temperate Zones a temperate climate, and the Frigid Zones a cold climate.

From what we have learned about zones, we know the greater the latitude (distance from the Equator) of a place, the colder must be its climate.

Latitude, however, is not the only thing that affects temperature, for there are places in the Torrid Zone which are covered with snow all the year around.

If you should climb a high mountain you would see how this is.

Though it might be very warm at the foot, you would notice that the air grew cooler and cooler as you ascended, until, if you mounted high enough—about three miles in the Torrid Zone—you would find the climate very cold, even freezing, and the ground covered with snow and ice.

In that short journey you would pass through all climates from the Torrid Zone to that of the Frigid Zone, and you would notice the different kinds of vegetation growing on the mountain side of about the same character and in the same order as though you passed from the Equator to the Poles. Near the top of the mountain, or at the *Snow Line*, you would see the dwarf shrubs and trees, and finally mosses and lichens somewhat similar to those you would find in the Frigid Zone.

From this we learn that *Altitude*, or height above the sea, also affects climate.

When a great deal of rain falls in a country, it has a Wet or Moist Climate; and when little, if any, rain falls, as in a desert region, the country has a Dry Climate.

A Temperate Climate is best for man. A hot climate makes people indolent, and a very cold climate makes them stupid.

## The Races of Men.

There are many different kinds of people in the world.

You have all seen White People and Black People, and perhaps many of you have seen Red People, or Indians. In countries over the sea are Brown People and Yellow People.

These five different kinds of People are called Races of Men, and include all the people in the world.

The other names for these races are Caucasian (White People), Negroes (Black People), Indians (Red People), Malays (Brown People), Mongolians (Yellow People).

The White People inhabit most of the Western Continent and Europe, and are scattered here and there over the whole world. They are the most enlightened of all the Races of Men and have made the greatest progress in learning.

Africa is the native country of the Black Race. From there Black People were brought to this country. At home they live in rude huts and gain their living by hunting, fishing or cultivating the soil.

The Indians, or Red Race, inhabit America. They live in huts or tents, and obtain their food very much as the Black Race does.

The Brown Race live in the South Eastern part of Asia, near the Coast and on neighboring islands, and are great boatmen.

The Yellow Race is composed mostly of the Chinese and Japanese. These people, next to the White Race, are the most highly civilized.

Locate on your maps the different races of men.

## Tropics and Polar Circles.

We have learned about the different Zones, the Torrid, the Temperate and the Frigid, and yet, were we to pass from the Equator to the Poles, we should notice nothing on the earth or in the temperature to tell us just where one Zone ends and the other commences. The temperature would continually grow cooler, but the change is so gradual it would be impossible to tell in this way alone, just when we had passed out of the Torrid into the Temperate Zone, or from the Temperate into the Frigid Zone.

There is a way, however, by which we can tell this very accurately. Observe the sun at mid-day or noon, and you will notice that it is not quite overhead or in the *zenith*, at any time of the year, and that the shadow which you cast always falls towards the north. In summer this shadow is very short, but it grows longer each day until winter has come and the sun has reached its lowest point in its southward journey.

Now, if the sun should go a little higher in the sky in summer, until it reached the zenith, you would cast no shadow at all. If it passed beyond the zenith, toward the north, your shadow at noon-day would fall toward the south. Or, if, instead of the sun's going north, you should go south, the same result would follow.

You might travel south far enough, so that when the sun had reached its farthest point north, you would be directly under it, or so that the sun would be in the zenith, and you would cast no shadow. You would then stand on the dividing line between the Torrid Zone and the North Temperate Zone. Now could you go west as fast as the sun, so as to pass around the earth in one day, keeping the sun constantly overhead, you would go all the way round on this dividing line.

Or,if you can imagine a very long straight rod as passing through the sun and extending to the earth at your feet, its point would make a mark clear round the earth in a day, as the earth rotates on its axis, which would represent this dividing line.

Remember then, whenever you are so situated that the sun is directly over your head on the day that it has reached its farthest point north you will be on the *Tropic of Cancer.*

*The Tropic of Cancer* is the boundary between the Torrid Zone and the North Temperate Zone; or, the imaginary circle around the earth on which the rays of the sun fall vertically when it has reached its farthest point north—*Summer Solstice*. This circle is found to be about 23½ degrees north of the Equator, or a little over one-fourth of the distance from the Equator to the North Pole.

Again, if you should go south far enough so that the sun would appear directly overhead when it had reached its farthest point south (Winter Solstice) you would stand on the boundary between the Torrid and South Temperate Zones, called the *Tropic of Capricorn*. This is situated 23½ degrees south of the Equator.

We have already learned that the sun lights up one-half of the earth's surface at a time; so, if the sun were directly over the Equator, its farthest rays would just reach the poles, and the days and nights would be of equal length everywhere.

Let us imagine two very long, straight rods fixed to the sun, so as to move just as it does, and extending, one north and the other south, along these farthest rays of light until they reach the poles.

Now if the sun should begin to move north the ends of these rods would also move, the north one going beyond the North Pole and the south one coming this way from the South Pole. When the sun reached 23½ degrees north of the Equator, so as to stand over the Tropic of Cancer, the end of the north rod would extend just as far, or 23½ degrees beyond the North Pole, and the end of the south rod, 23½ degrees this side of the South Pole. Now while they are in this position, and the earth rotates once on its axis, the ends of the rods will describe circles 23½ degrees from the Poles.

The sun is at the Summer Solstice, or highest point north, and therefore, as the rods represent the farthest rays of the sun, we know that at this time, the light of the sun extends just 23½ degrees beyond the North Pole, and within 23½ degrees of the South Pole. These circles represent the boundaries between the Temperate and Frigid Zones. The one on the north is called the *Arctic Circle;* and the one on the south is called the *Antarctic Circle.*

Now if the sun should move south again, until it stood over the Equator, or at the Equinox, the ends of the rods would again be at the poles, and the days and nights everywhere of equal length.

Then, if the sun should move 23½ degrees south of the Equator or to the Winter Solstice, the end of the north rod would move 23½ degrees this side of the North Pole, and the end of the other rod 23½ degrees beyond the South Pole—the limits of the sun's rays at the Winter Solstice. By the rotation of the earth, the same circles would be described as before.

We can learn from this something of the length of the day and night at the Poles. When the sun was on the Equator, the rods extended just to the Poles. Now it requires just three months to pass from the Equinox to the Summer Solstice and three months to go back to the Equator, or Equinox again, or six months in all. Thus, the sun would shine on the North Pole all the time for six months, and there would be six months night, while the sun goes to the Winter Solstice.

The seasons in the Northern Hemisphere are just the opposite of those in the Southern Hemisphere at the same time. When it is winter with us it will be summer with the people in South America.

Remember that the Equator, Tropic of Cancer, and the Tropic of Capricorn are imaginary lines *on the earth*, and the Equinox, Summer Solstice and Winter Solstice are the *positions in the heavens* which the sun appears to occupy when it is directly over each of these circles, respectively.

The days get longer aud longer in summer time as we go towards the Poles where they are six months long. When, if we should go south at the same time, the nights would keep getting longer, until at the South Pole we should find the night six months long.

The days of the summer are often hotter in St. Paul and other northern towns than at places much farther south. Let us see how this is. We know that the farther we go north in the summer the longer the days get. When the day is fifteen hours long at one place, it will be eighteen hours long at another, farther north; twenty hours at a place still farther north; two days long at another; a week long at another, and so on, until finally, at the Pole it is six months long. Now the slanting rays of the sun at the north do not give as much heat in the same length of time as the more direct rays at the south, but the sun shines many more hours a day and in this way more than makes up the difference, except in high latitudes, where the very slanting rays can give but little heat, though they continue for months.

## How to Learn About the Sun's Journey.

There is a simple way to learn about the sun's journeys each year. Drive a straight stick two or three feet long perpendicularly into the ground, in some place where it will not be disturbed, and in full view of the southern sky, so that the sun can always shine on it at mid-day. Determine a line running north from the foot of this stick to serve as a "noon-mark." When the shadow of the stick falls exactly north, or upon this line, it will be mid-day, or noon. Now note at noon, daily or weekly, the length of the shadow which the sun casts and carefully mark it by a peg, or in some other way. If you should commence this in the summer, you would notice that the shadow would grow longer each day, until about December 21st (the Winter Solstice), when it would seem to stand still for awhile, and then begin to grow shorter until about the 21st of June (the Summer Solstice). These are the limits which should be marked as the Solstices. At the half-way point mark Equinox{Autumnal / Vernal, for at this point the sun crosses the Equator first on its journey south, about September 22nd, and then on its return journey north. March 21st, when the days and nights are of equal length.

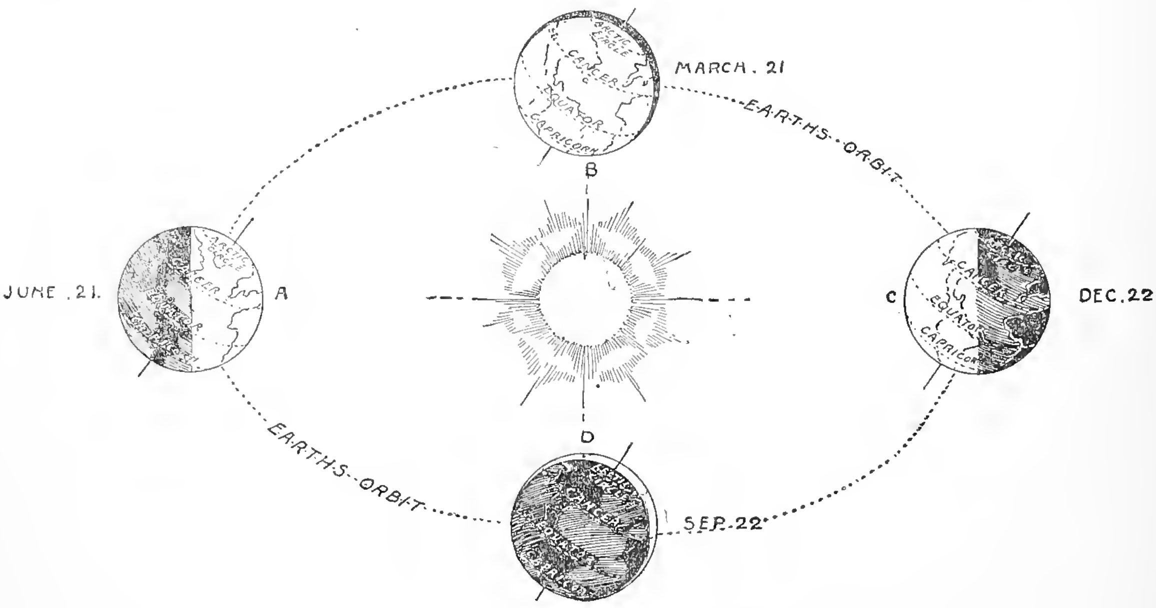
This experiment might be performed on the floor of the school room, if the room faces south, so that the rays of the sun can come in at the windows at noon all the year round.

As you see the shadows lengthening from day to day, remember that the rays of the sun are gradually leaving the Arctic regions and their long night is at hand, while the day is just breaking in the Antarctic regions.

In all we have said, we have spoken of the sun as moving, as it appears to do. It would really make no difference in the results whether the sun moved north or south, whether the earth's axis inclined towards the north part of the year, and towards the south the other part, or whether the earth made a yearly journey around the sun, its axis inclining in the same direction all the time, as it really does. In any of these cases, the sun would appear to move.

From the diagram given below you can learn about this yearly journey of the earth, and see just how its axis is inclined so as to make the sun appear to move north and south.

Observe that the rays of the sun strike the earth vertically at the Equator twice during the year, in the spring and fall; once at the Tropic of Cancer, in our summer, when the rays reach beyond the North Pole; and once at the Tropic of Capricorn, in our winter, when the rays reach beyond the South Pole. The axis of the earth is inclined about 23½ degrees to the plane of its *orbit*, or path around the sun.




Put a stick through an apple or orange for an axis to represent the earth. Revolve this about some other object representing the sun, and, remembering to keep the axis always pointing in the same direction, show how the change of seasons takes place.

## The Atmosphere.

There is a part of the earth which we think little about, and yet it is just as important as the land or water, indeed, without it we could not live, nor could any animal or plant long survive. This part is called the *Air* or *Atmosphere*.

In going up high mountains, or in balloons, people find that the air grows thinner and thinner as they ascend, and, when three or four miles up, it becomes so rare, or thin, that breathing it is difficult. From this it is believed that the air cannot extend very many miles above the earth and that it does not fill all space, so that the earth floats in it, as people used to think. It is rather a gaseous body which envelopes all the land and water of the earth, and goes everywhere with it.

The earth then, is made up of land, a great ocean of water, and a greater ocean of air.

At the bottom of this ocean man lives and moves about, while above and around him flit and sport the various winged forms of insects and birds, the fish of this vast aerial sea.

At about three and one-half miles above the earth, the air is one-half as dense as at the surface. That is, the lower half of the air, in weight, is three and one-half miles thick; while the other half extends upward many miles more—perhaps hundreds—nobody knows.

Although it is cold on top of high mountains, the rays of the sun beat down so strong and hot that the hands and face, where exposed, are blistered. Then, almost as soon as the sun is set, whatever heat there is, all seems to escape at once, and the air becomes very much colder than before. This shows that the air at the surface of the earth where it is denser, serves as a shield to protect us from the fierce rays of the sun; and also as a blanket, to keep the warmth which has come to us from the sun from escaping again. Indeed, if it were not for this, every night, even in mid-summer, would be as cold as in winter. Were it not for the air, our lakes would boil under the noon-day sun in summer and freeze at night.

Air has weight and is much heavier than some gases, such as hydrogen or common gas, which is used in cities to light the streets and homes and with which balloons are sometimes filled. Still, it is very light when compared with other substances. A column one inch square extending to the very top of the atmosphere would weigh fifteen pounds. This means that the air presses fifteen pounds on every square inch of the earth's surface at sea level; fifteen pounds on every square inch of our bodies. As the air presses on all parts of us equally, and we have always been used to it, we do not notice the pressure. We should remember that the air presses in all directions equally, upward and downward. The great pressure on the open palm of our hand downward would be more than we could support if it were not for the equal upward pressure under the hand. The air buoys us up and actually makes us lighter, something as the water does when we go in bathing.

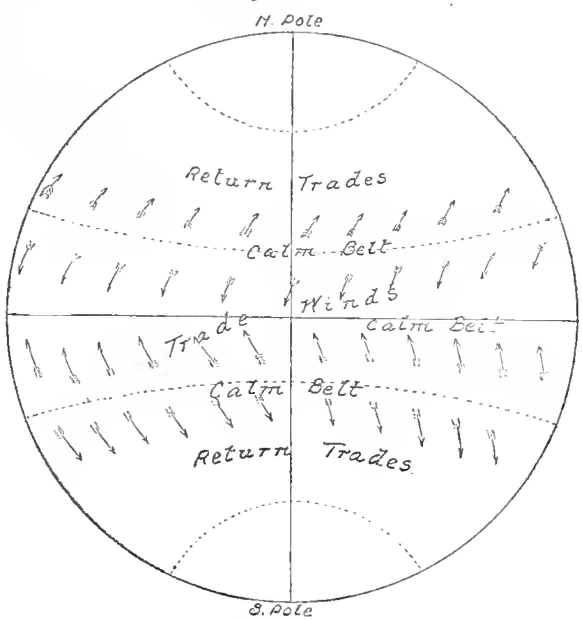
The air presses down harder at some times than at others. When the air is moist, or just before a rain, the pressure is less than when dry. Watery vapor is lighter than dry air. The instrument which measures this air pressure is called a *barometer*. It consists of a glass tube, with one end closed, and from which all air has been taken. This is inverted over a cup of mercury, so that its open end rests in the mercury. The pressure of air on the mercury in the cup makes it rise in the tube. The mercury rises or falls in the tube according to the pressure of the air. By means of a little scale at the back of the tube, one can read how much it falls or rises at any time. By this instrument people can tell when storms are coming. A "low barometer" indicates stormy weather. People also use this instrument to tell the height of mountains. Explain.

When air is heated even slightly it expands and becomes lighter than the air all around it; so the warmer air is displaced, forced up, by the pressure of the cooler and heavier air. For this reason the warm air of the room rises, the cooler air from without forcing it to do so, and rushing in to take its place at the floor.

Thus, when large areas of land or water become heated, the air over it becomes heated and rises, being displaced by the cooler and heavier air around it. So great currents of air, called *Wind*, are started. The wind is simply air in motion. *Cyclones* are violent winds having a whirling motion. They are sometimes called *Hurricanes*, *Tornadoes* and *Typhoons*.

NOTE—A cubic foot of cool air might be so expanded by heat that it would fill a large room. When so expanded it would be very rare and very light compared with the same bulk of cool air. The room full would weigh no more than the single cubic foot of air before it was heated. The rare, light air rises, is displaced by cooler, heavier air, for the same reason that oil is displaced when water is poured into a vessel containing oil. The air is forced through the register—a hot wind on a small scale—through the stove and up the chimney by the pressure of cooler and heavier air all about it.

When smoke from the chimney falls to the ground it is because the air is *light*, and not as we often hear people say, "because the air is heavy." When the smoke rises above the chimney, forming a tall column, the air is still and *heavy*.




TRADE WINDS.

In Equatorial regions, the air is always warmer, hence lighter, than it is towards the poles, so that it is constantly displaced or forced up by the air from the cooler zones, forming ascending currents where the heat is greatest, and upper over-flow currents of warm air moving towards the poles.

Were the earth at rest there would always be two lower currents or winds moving from the poles towards the regions of greatest heat, an ascending current under the sun and two upper currents from the Equatorial regions towards the poles, thus completing the great circuit.

But the motion of a place at the Equator is much greater than of one near the poles. During one rotation of the earth, or in 24 hours, a place at the Equator moves 25,000 miles, or at a velocity of about 1,000 miles an hour; but this velocity constantly diminishes as the poles are approached, where it is nothing.

Now, the wind, starting from the poles where the velocity is slow, gradually falls behind the meridian on which it starts and, as it nears the Equator where the velocity is so much greater, blows from the north-east in the northern hemisphere and from the south-east in the southern hemisphere, causing what are called *Trade Winds.* They blow steadily in the same direction and are confined mostly to the Torrid Zone. These winds are very useful in driving trading vessels from place to place. Columbus made use of them in his voyage to America. (The prevailing wind at the Equator is from the east.)

### The Anti-Trade Winds.

Part of these warm upper currents, or winds, from the Tropics fall to the earth in the Temperate regions and go on toward the poles as lower, or surface currents. As they started out with the velocity of the Tropics, they travel faster than the parts of the earth they pass over nearer the poles, and, therefore, blow from the south west in the northern hemisphere and from the north west in the southern hemisphere. These are called the *Anti-Trade Winds, or Return Trade Winds.* They are the prevailing winds of the Temperate regions, especially where not affected by mountains or other physical agencies.

### Calm Belts.

There is little movement of the wind in places in the Equatorial regions where the air rises, and in the Temperate regions, where the upper currents fall. So these are called *The Calm Belts or Zones.* The Calm Belts are not always in the same place. They move north and south with the sun so that there are Equatorial calms, calms of Capricorn and calms of Cancer, according to the place of the sun in the heavens. Thus periodical rains are produced in tropical and sub tropical countries.

### Monsoons.

There are portions of the earth that become hot from the direct rays of the sun at one season of the year, while other portions are very cold at the same time. This causes the air to go from the cold to the warm portions. Then, at another season of the year this hot region becomes cold, and the cold region becomes hot and so causes the wind to blow in the opposite direction. Winds that blow in one direction a portion of the year and in the opposite direction another portion of the year are called *Monsoons.*

Indicate the Trade and Return Trade Winds and Monsoons on your maps.

## Vapor, Dew, Rain and Snow.

Water spilled on the floor soon disappears, or "dries up." It is not destroyed, but simply changed in form. It has become vapor, is mingled with the air and is invisible. Should it come in contact with some cold body, as a window pane, it would be condensed into visible moisture again, and might, perhaps, run down the pane in drops of water. The moisture which you notice on the window pane in cool weather, the frost in freezing weather, and the drops that gather on the outside of a pitcher of ice water in summer, are nothing but this vapor condensed.

Salt compels ice to melt and reduces the temperature below the freezing point. Fill a tin pail with ice broken in small pieces and mixed with salt. Notice in a short time the frost gathering on the outside of the pail, though it be in a very warm room and on a summer day. Why?

Although water itself is heavier than air, the vapor of water is lighter than air and rises in it. The warmer the air, the more vapor it will take up. When the air has taken up all the moisture it will hold, it is said to be *saturated.* As it becomes cooler it gives up this moisture again in the form of dew, rain, frost, hail or snow. This vapor of water floating in the air, partially condensed so as to become visible, is called *Fog*, if near the earth; and *Clouds*, if high up in the air.

At night some of the heat escapes from the air and so it becomes cooler and gives up part of its moisture in the form of *Dew.* (On cloudy nights dew does not fall, as the clouds serve as a blanket to keep in the heat.)

When this moisture falls in quantities in the form of drops, it is called *Rain.* Rain is produced by the air becoming suddenly cooled. Rain drops are formed by the uniting of many small particles of vapor.

*Frost* is frozen dew.

*Hail* is frozen rain drops.

*Snow* is frozen vapor crystallized.

The air may be cooled by winds coming from mountains and other cold parts of the earth, and thus be compelled to give up its moisture. Mountains are of great value, as without them we should have but little rain fall, and our country would become almost a desert.

Oftentimes air loaded with moisture blows against or over mountains. In such cases it gives up its moisture in the form of rain or snow. If the mountains are very high most of the moisture is taken out of the air, so that the country just beyond, over which this air passes, is a desert. Rain falls more abundantly and regularly in the regions about the Equator. This is because the air is so warm, evaporation goes on rapidly, keeping the air so near the point of saturation that the slightest reduction in temperature causes a downpour of rain.

## Glaciers and Icebergs.

In the Arctic regions, and on the tops of high mountains this moisture falls in the form of snow, and, as it cannot melt on account of the continued cold, the snow gets deeper and deeper. Finally, by its weight from above, the lower portions are pressed into solid ice and the great weight of the mass gradually forces it down the side of the mountain, or incline of land, and through valleys—a huge river of ice. This ice stream is called a *Glacier*. It moves very slowly, sometimes only a few feet a year. A Glacier is constantly wearing down the mountain sides and scouring the valleys, carrying fragments of earth and rock along with it to the lower levels. Most of the soil about us containing boulders, has been brought down from regions farther north and left by glaciers, which, in ages past, covered much of the northern part of our country.

In the warm latitudes the lower part of the glacier melts almost as fast as it moves and forms a great stream of water, often the beginning of a river; but in the Arctic regions these glaciers push out into the sea where great pieces are broken off and float away as *Icebergs*.

Ice is just a little lighter than water, so it floats. It is fortunate for us that this is so, otherwise ice, as it formed in winter, would sink to the bottom and become so thick that it would not thaw out in the longest summer.

As the icebergs float about they are often surrounded with fog. Why? About seven parts of the iceberg are under water and one part out.

## The Ocean, the Great Storehouse of Water.

You have noticed perhaps, how, soon after a heavy shower or rain storm, the roads get dry again, and all the pools and ponds of water disappear in the warm sun. Some of the water soaks into the earth, but much of it is taken back into the air, as we have already learned.

Now, the great store-house of the water is the Ocean. The air heated by the sun, receives vast quantities of water in the form of vapor from all over its broad surface, and, wafting it over the land, gives it up in grateful showers.

The water enables the plants and animals to live and grow. Some of it soaks into the soil and bubbles out again in *Springs*, which gather into ponds and lakes, or into brooks and rivers, and is carried back into the sea again. Of course, this vapor rises from all water, whether of sea or land.

All that vast quantity of water which flows into the sea from the Amazon, the Mississippi, and all the other rivers of the earth and indeed, much beside, is what has first been taken up from the ocean as vapor by the heat of the sun.

This great round—from ocean to land in vapor, from land to ocean in river—goes on without end.

The air and the water are all the while at work wearing away the rocks and mountains and higher portions of the earth and carrying them down to fill up the lower places. Thus the soil of the river valley is made, and even the coast of the sea extended.

(Water, getting into crevices of rocks, freezes and by its expansion breaks off great pieces. In this way, rocks in regions where there is frost are slowly broken up.)

### The Effect of the Ocean on Climate.

The climate of a place is affected not only by latitude and altitude but also by its nearness to large bodies of water.

In summer, the ocean and other large bodies of water receive a great deal of heat from the sun, which is given out slowly when the cold weather comes on. The air then passing over its surface is warmed, and so greatly modifies the temperature of all places touched by it. Large and deep bodies of water are warmed or cooled more slowly than the land, so water in winter is warmer and in summer cooler than the land. In the warm season the air from the ocean or other large bodies of water lowers the land temperature. In winter, when the land is covered with ice and snow, the breezes from the ocean make the temperature warmer than it would be otherwise.

Thus we see that the ocean, which never gets cold enough to freeze, except around the Poles, tends to keep the temperature of places near the shore more moderate all the year. The same is true of all large bodies of water, up to the time of freezing over.

### Land and Sea Breezes.

From what we have just learned we can understand how land and sea breezes are caused. In the day time the land soon becomes warmed by the sun and heats the air over it making it lighter, so that the cooler and heavier air from the ocean displaces it, causing a sea breeze. At night, the land soon looses its heat and becomes cooler than the sea, so the wind blows from the land towards the sea, causing a land breeze.

### The Gulf Stream and Japan Current.

But there is something else that affects climate, more wonderful perhaps, than anything that we have learned yet. We all know about streams of water running through the land, but who would think that streams of water like great rivers—yes, far deeper and wider than any rivers on land—could flow through the ocean? Yet it is so.

In the Torrid Zone where the rays of the sun always beat down with full force, the surface of the ocean becomes very warm. Heat makes water expand and become lighter than cool water, bulk for bulk. So that the great body of heated water within the tropics is displaced by the cooler water on either side in the Temperate Zones, and is forced to rise, to overflow, as it were, and it goes constantly toward the Polar region, while the cooler water presses in to take its place, causing both warm and cool currents. The winds and motion of the earth on its axis also help to cause these currents.

There are various streams or currents in the ocean, the most important of which is the *Gulf Stream*. This stream begins near the Gulf of Mexico and travels north-east, spreading out as it goes, until it washes the western shores of Europe and reaches the northern limits of Norway and even Iceland. The cold stream which goes south to take its place, is called the Arctic Current and flows along the coast of Labrador and the United States.

The warm breeze from the Gulf Stream makes the climate of Iceland and all that portion of Europe which it touches, much warmer than it would be otherwise; while the cold Arctic Current chills the air above it and unites with the westerly continental winds to make Labrador a bleak and frozen waste. What would be the condition of Western Europe if the prevailing winds blew in the opposite direction?

The cold stream usually flows below the surface, for the reason that warm water, as we have learned, is lighter than cold.

At some distance off the shore of Newfoundland the waters of the Gulf Stream and Arctic Current meet, and, as the icebergs carried along in the cold current are numerous, all that section is covered with fog a large portion of the time. Why? A branch of this current goes round by Africa and back to the tropics of America again.

There is another very warm current in the Pacific Ocean named the Japan Current, or Kuro Siow (Black Current), as the Japanese call it. This rises in the Pacific, south of the Japan islands, and flows north-east to Alaska, and then south along the coast of North America, making the climate of all the coast mild, and the lower portion of California almost tropical. The Arctic Current flows south through Bering Strait. Indicate these currents on your maps.

## The Climatic Zones.

The slope of the land and prevailing winds also affect climate.

In the northern hemisphere, where the land slopes toward the south it receives more of the sun's heat than where it slopes toward the north, as the rays of the sun fall on it more directly.

What is the case in the southern hemisphere?

Where the prevailing winds are from the mountains or cold regions the climate is cooler than when they come from warm regions.

So we see there are many things which affect climate beside latitude. For this reason CLIMATIC ZONES differ somewhat from the zones which are marked off by the Tropics and Polar Circles, their boundaries being more irregular.

## Isotherms.

Isotherms (equal heat) are lines drawn on a map connecting all places having the same average annual temperature.

The Climatic Zones are marked off by isotherms.

## Altitude and Latitude Compared.

From the Equator to the Poles is 90 degrees. One degree therefore equals six thousand miles divided by ninety, or nearly seventy miles.

Now it is found that in climbing mountains, every 300 feet of height makes about as much difference in climate, or temperature, as a degree in latitude. In other words, a person would experience the same difference of temperature in going to a height of 300 feet as in traveling one degree, or seventy miles, in latitude.

For our purposes we may consider 1,000 feet in altitude equal to three degrees in latitude, or about two hundred miles.

To how many degrees and miles, in latitude, as regards climate, is a mountain top 15,000 feet high equal?

Remember that the same products would grow on the mountain sides as in the lower levels where the temperature is the same.

Whenever you come to mountains hereafter, determine what crops could be raised on them at different elevations.

Which Grand Division has the most coast line in proportion to area and what effect has it on its settlement, climate and commerce?

## Mariner's Compass and the Magnetic Poles.

Almost all countries border on the sea, in part at least, and have seaports from which ships go in trade. Some nations, like Great Britain, have a great number of vessels, plying between all seaports of the earth.

It is easy to find our way on land by means of land-marks, and especially to go over again a path or road once traveled, but on the ocean there is no road or path—nothing but the ever changing water everywhere.

So seamen make use of the sun, moon and stars to guide them. But sometimes the clouds or fogs hang thick and heavy for days together and no part of the heavens is visible. Ships would soon drift far out of their way and be lost if it were not for a wonderful little instrument called the Mariner's Compass, which tells the direction the ship is going. This instrument was known at the time of Columbus and was used by him. Indeed, had it not been for this, he would not have undertaken his great voyage of discovery.

We shall be interested to know more about it.

If you suspend a bar magnet at the center by a string, so it will swing horizontally, you will notice, when it has come to rest, that it points nearly north and south.

Now mark on a disk of cardboard, all the points of the compass, and fasten it to this magnet so the north point of the disk lies on the north end of the magnet. When the magnet again comes to rest you will be able to read on the disk the direction of all places from you. This is a simple form of the Mariner's Compass.

### THE MAGNETIC POLES.

Iron attracts either end of a bar-magnet equally well, but bring near the north end of it the north end of another magnet and the first will swing away, while if you present the south end, it will be attracted to it. That is, the like ends or *poles* of magnets repel each other and the unlike poles attract.

People noticing this thought that the earth must be a great magnet also, as it seemed to act in the same way as a magnet does. So they sought to find its Poles.

The north end, or Pole of the Earth-magnet, was found to be just north-west of Hudson Bay, and the south Pole, in the Antarctic Ocean.

The Earth-magnet is what affects the Mariner's Compass. Indicate the magnetic Poles on your maps.

### THE INTERNATIONAL DATE LINE.

The International Date Line is the line separating the discoveries of the Portugese going eastward around the Cape of Good Hope and those of the Spanish and others going westward. (This line runs south through Bering Sea, having the Philippine Islands to the east of it, and Japan, Formosa, Borneo, Celebes, Papua, Australia, New Zealand, etc., just to the west of it.)

There is a difference of one day in the time of places on each side of this line.

If a person should go around the earth in an easterly direction, or in the same direction as the earth rotates, he would lose a day; and if he should go around in the opposite direction, he would gain a day.

If he should start at noon and go westward as fast as the sun appears to go, it would always be noon with him, however long he traveled. Yet his watch (not the sun) would mark off the time, one hour for every 15° traveled. At the end of 24 hours he would arrive at the starting point, where a whole day, with its evening, night and morning, has passed; while, with him, the same day yet remains. And so it would be, however slowly he traveled round the earth in a westerly direction. He would lose one day.

Should he travel round the earth in the opposite direction he would gain a day. If he should go round in 24 hours he would meet the noon-day sun just half way round and so he would have two days (with two evenings, nights and mornings) in this time, or the days would be 12 hours long. He would thus gain a day.

The common or civil day lasts from midnight to midnight—24 hours—and travels around the earth with the sun, or from east to west. The new day begins at the International Date Line, and, in its circuit of the earth, reaches places later and later until it comes to the Date Line again —24 hours, or one day, after leaving it.

A new day now begins at the Line, while the old day will yet continue 24 hours just east of it. If the new day was Monday on the west side of the Line, the day on the east side of it would be Sunday.

Thus, sailors in crossing the Line add a day in going west, and drop a day in going east. The 180th meridian from Greenwich is quite generally regarded by sailors as the International Date Line.

## Forests.

Forests are of great value to man, not only for fuel and lumber, but for protection against violent winds and storms and for equalizing the temperature of the air, and the distribution of moisture.

Forest trees store up rainfall in the spongy soil of their roots, and by their shade, keep it from evaporating, and so are able to return it to the air or distribute it gradually and evenly in the natural river channels. In regions where the forests have been cut down less rain falls, streams dry up and drought often occurs. When the rain does fall it runs quickly into the valleys and swells the streams into dangerous torrents.

Forests on mountain sides keep the soil from being washed away and, when the mountains are very steep, as in the Alpine regions, form barriers against avalanches.

The falling leaves of trees decay and enrich the soil.

In many regions of the earth where there is sufficient rainfall and favorable climate, extensive forests grow.

Most civilized nations appreciate the value of forests and take great pains to preserve them. Many of the states of our own country set apart a day each year, called "Arbor Day," for the planting of trees.

Indicate on your maps the principal forest regions of the world, and the prevailing kinds of trees in each.

## A TRIP TO GREENLAND.

(By Prof. G. F. Wright, author of "The Ice Age in North America," etc.)

If one is in America, the natural place from which to set out for Greenland is St. John's, Newfoundland. This is a quaint city of about twenty thousand people, mostly engaged in fisheries of one kind or another. The harbor is completely surrounded by rocky hills four or five hundred feet high, except at the narrow entrance through which vessels pass from the stormy ocean to the placid waters within. Here one finds ships from all parts of the world, and of all kinds. Owing to the interest of France in some of the islands near the coast, a French man-of-war is a frequent visitor to the harbor, and there is usually an English man-of-war not far behind to see that no mischief is done.

Close to the water's edge, a fine system of docks furnishes every facility for unloading and loading the products of the fisheries. Small ships are constantly coming in with freshly caught fish, to be reloaded upon larger ships, which are to carry them to the markets of the world.

### ICEBERGS.

Great care is exercised in constructing vessels to sail in these waters on account of the numerous icebergs. These icebergs are most beautiful and imposing objects and as mysterious as they are beautiful. Their size is often enormous. One which we measured was estimated to be 750 feet high, or nearly 300 feet higher than the highest pyramid of Egypt, while it probably covered several acres of space. It rose from the waters in two vast towers, which, as they glistened in the sunshine, seemed like the remnants of a fairy castle. The color of the ice was for the most part an intense blue, but in the upper portions where the sun had partially honey-combed it, the color was that of newly fallen snow, while near the water's edge, where the waves dashed up against it and rolled over the submerged portion between the two towers, the blue color was changed into a delicate green. Large flocks of birds lighted upon it and gave it the appearane of a permanent island of ice.

As the larger part of an iceberg is beneath the water, this iceberg probably extended two or three thousand feet below the water. The great depth to which the ice extends below the water, gives remarkable stability to icebergs so that they are not affected by the winds and surface waves. In the lee of an iceberg, a ship is as well protected from the wind as it would be in the lee of an island.

The motion of an iceberg is determined by the deep under currents of water, and is therefore slow, being, in favorable circumstances, at the rate of about ten miles a day. The icebergs which we see off the coast of Newfoundland and Labrador have been a long time on their journey; for they were formed from the glaciers of Northern Greenland, two or three thousand miles away, and hence, many of them have doubtless been a year or more on their way to warmer climes.

## Collision with an Iceberg.

There is no danger that an iceberg will run down a ship, but there is danger that a ship will run into an iceberg and be wrecked in the process. On the morning of July 17th, 1894, the steamer on which our party was going to Greenland had this unfortunate experience. We were in the Strait of Belle Isle, having just passed the most northern lighthouse on the Atlantic coast. Before the fog settled down upon us more than fifty icebergs were visible from the deck of the steamer. Yet they seemed so far apart that the captain thought it safe to keep the vessel moving at half speed. But suddenly the ice-pilot noticed a light spot in the mist ahead of us which he too well knew to be "ice blink," or reflection from the iceberg. The wheel was reversed and the rudder turned one side, just as the vast mass of the berg loomed into view ahead of us. Out of the mist like a huge monster it seemed to come, reaching above us hundreds of feet, and streching out on either side into the mist beyond the extent of our vision. It was too late to avoid a collision. The safest plan was to take it straight ahead; and so we did. The ship trembled and reeled, and the massive plates of iron crumpled under the blow like cardboard, while numerous small pieces of ice fell down upon the deck below.

Fortunately, the force of the collision was felt above the water's edge; otherwise we would have gone to the bottom in a few moments. As it was, we were able to make a neighboring harbor in Labrador, where we patched up the breach sufficiently to render it safe to venture back to St. John's and make permanent repairs. These having been completed, we set out for Greenland again, going almost directly north for a thousand miles, and keeping farther east than before so as to be clear of the ice, that at almost all seasons of the year, cumbers the coast of Labrador.

## Floe-ice and Seals.

The icebergs which are brought Southward by the Labrador current are accompanied during the larger part of their course with a vast stream of floe-ice, i. e., of broad, flat cakes of ice which rise from fifteen to twenty feet above the water, and are often so closely packed in together as to form one compact mass. The floe-ice usually melts and disappears before getting so far south as Newfoundland; but it furnishes a most important hunting ground for the inhabitants of St. John's. Hundreds of thousand of seal get upon the ice in the far north and float down with it. Indeed, it is the favorite breeding place of the seal. Early in the spring, the ships from St. John's and other ports, with sixty or seventy men on board of each, venture up into this ice during the breeding season of the seal. On reaching it, the men go out upon the ice and slaughter the animals in great numbers, saving only the skins and the fat or "blubber," from which a valuable oil is made.

It should be said, however, that these are not the fur seal of which we hear so much in portions of Alaska; but the skin of these seals is covered with a coarse hair and is valuable chiefly for making some kinds of leather. In Greenland the skins are used for water tight clothing and for covering the boats of the natives. The indiscriminate slaughter of these seals, in which the young are killed with the old, is already diminishing the supply, and rendering it more and more difficult for the people of Newfoundland to gain a livelihood. It was painful to see in the shops of St. Johns the innumerable stuffed specimens of "baby seals" that were on sale as curiosities.

## A Thrilling Experience on Floe-ice.

Several years ago a party of Greenland explorers had a thrilling experience upon one of these ice-floes, which came along the coast of Labrador. The United States government had sent an expedition under the command of Mr. C. F. Hall to explore the northern part of Greenland and the coast of North America beyond Smith's Sound. After reaching a point considerably beyond the 80th parallel of latitude, Mr. Hall died and the expedition endeavored to return. In October, 1871, when they were encompassed with ice-floes, in about latitude 78, a storm arose and, thinking that the ship was likely to be crushed, the crew began to unload the provisions and stores upon the ice. When this was about half accomplished, and about twenty of the crew (including two families of Eskimo, one of them having a babe about two weeks old) were on the ice, a change in the wind separated them from the ship and in the darkness and confusion which followed, they were left to drift away.

Captain Tyson, who was with them, assumed charge of the party. Fortunately, they had some provision and fuel, a tent and one or two boats. Through the ingenuity of the Eskimo they constructed snow houses and added to their stock of provision by capturing an occasional polar bear and numerous seal, and by catching a few fish,so that they were able to prolong their existence for 196 days, during which they floated southward fifteen hundred miles. About the first of May they were rescued by one of the sealing ships which had come up from Newfoundland. None of the party had died, and the Eskimo baby has now grown to be a man and is living in Greenland.

## Spitzbergen Ice.

Four days of steam from St. John's brought us on the third of August within sight of the mountains along the coast near Frederickshaab, but, though only thirty miles away, we were unable to reach land by reason of a belt of floe-ice and icebergs that stretched along near the southwest shore for three or four hundred miles. This is called the Spitzbergen ice because it comes from the vicinity of that island, and is borne by a slow oceanic current southward between Iceland and Greenland to Cape Farewell, where it is turned northward by a branch of the Gulf Stream, to encumber the western coast as far as the Arctic Circle.

With this ice come large numbers of seal to supply the people upon the coast with necessary food and raiment. A considerable amount of driftwood also accompanies the Spitzbergen ice. This consists of trees which have grown on the banks of the Siberian rivers and have been washed away and borne into the Arctic Ocean to join the slow procession of Spitzbergen ice-floes of which we have spoken. As there are no trees in Greenland, the Eskimo are wholly dependent on this means of supply for the wood with which to make rafters for their houses, frames for their boats and handles for their spears and harpoons.

## Sukkertoppen.

After beating about for some days amid the calms and fog banks which habitually accompany the ice-floes, we at last succeeded in reaching the coast of Greenland at Sukkertoppen, where a new world dawned upon us. This is the largest settlement upon that coast, and is situated a little south of the Arctic Circle. On the 21st day of June, the sun would barely touch the northern horizon at midnight. In the early part of August when we were there, the twilight of evening merged into that of morning, making the midnight glow upon the mountains most brilliant and beautiful. There are about 400 people in Sukkertoppen, of whom all but seven are Eskimo. These seven consist of the two Danish officials and their families, all of whom are very upright, intelligent and cultivated persons. Though hearing from their home in Denmark only during the summer season, they seem to enjoy their life very much. In their well stocked, comfortable houses, with their library and piano, they pass the winter in perfect comfort, while the attention to the various wants of the natives gives them sufficient occupation to prevent the time from hanging heavily upon their hands, even when, in winter, midnight darkness and deep snows envelope them in two-fold gloom.

Though the Eskimos have long been converted to Christianity, and can all read and write, they continue, for the most part, to live in their primitive condition. As there is no land to be cultivated, the people live wholly on flesh and fish. The word "Eskimo" means "flesh-eater." It was given to them by outsiders, and is not the name which they like. They call themselves "Innuit" which means "the people." In their views, they are the people, and we the barbarians.

As we steamed into the harbor at Sukkertoppen, the whole settlement was out upon a promontory to welcome us. The women with their young children slung over their shoulders were the most interesting portion of the group. They seemed to us to be dressed just like the men, but we soon saw that this was a mistake—though it is a fact that they do all wear trousers.

### Dress of the Eskimo.

The dress of the women consists of a long pair of ornamented, watertight, seal skin boots, reaching above the knees. Above these is a short pair of trousers reaching from the boots to the waist. These, also, are of seal skin and more or less ornamented. Above the trousers there is a loosely fitting sacque with a pouch, back of the neck, large enough to hold a three year old child, whose bright eyes are very sure to shine out with great contentment from close beside those of its mother or older sister. Underneath this sacque there is, in cold weather, a garment made of birdskins to secure warmth. On dress occasions a brilliant necklace of beads adorn the breast of the wearer, and all together really make an attractive attire.

The dress of the men differs from that of the women chiefly in the length of the trousers, which come down to the feet, and in the substitution for the baby's pouch in the woman's sacque of an extension which can be brought up over the head to make a close fitting cap, which, when tied under the chin and fastened securely about the wrist to seal skin mittens, makes the upper part of their clothing perfectly water tight.

Apparently the men never cut or comb their hair. The women, however, take great pains with theirs, though it is doubtful if they often comb it. Their mode of doing up the hair resembles closely a fashion which has recently been appearing in civilized countries. They pull it up to the top of the head and twist it into a roll, which they keep in shape by binding it closely with ribbons of various colors, leaving the hair to project a little above the ribbon and to stand up as straight as possible upon the top of the head. The unmarried women use red ribbon, the married women blue, and the widows black; but when the widows are willing to be married again some red is mingled with the black and a narrow band of white is put around their foreheads.

### Eskimo Houses.

The houses of the Eskimos of southern Greenland, called "igloos," are made of a wall three or four feet high, built on flat stones and turf, and covered with a dome shaped roof with a covering of turf. One small window ordinarily faces the south, admitting the only light which comes in from the outside. The entrance is by a low, long, narrow, crooked doorway through which one has to crawl on his hands and knees to get in. In the interior, there is a narrow passageway along one side of the room in front of the windows, and along side of it, a broad shelf about a foot from the ground, wide enough for a man to stretch himself out with his feet to the wall. Here, closely packed, the inmates sleep by night and lounge by day, several families usually occupying one room, being separated only by low partitions across the shelf which serves for their feet.

Of furniture there is scarcely any. The most important article is the stone lamp stationed at the head of each family partition. This is the special care of the women. The lamp is a piece of soapstone with a shallow depression in the top which they fill with seal blubber. The wick used is made from a species of moss which is dried and placed around the edge of the lamp and after being saturated with oil is lighted, when the heat melts the blubber and continues the supply, as the burning wick does in the tallow candle. Much skill is shown by these women in taking care of their lamps, which are kept continually burning and usually furnish the only artificial heat provided for their houses.

Still, the people do not suffer from the cold in these igloos even during the most inclement winter weather, for not only are the walls at the outset impervious to winds, but during the winter, deep snows completely bury the houses and give them double protection from the cold; while warm clothing, quilt and sleeping bags made from the skins of reindeers, bears, and birds are sufficient to give comfort even when out of doors. Additional warmth is furnished by the blubber which they all eat in great quantities, it being cheaper to obtain the heat by digesting it in the stomach than by burning it in a stove. The demands upon their system give the Eskimos a hankering for all kinds of fat, so that the Eskimo children eat candles as civilized children eat candy.

### Means of Travel, and Food of Natives.

In southern Greenland the only means of travel is by water. The interior of the country is deeply covered with ice, upon which only an occasional traveler dares to venture. For ages more snow has fallen on the land than could melt, hence it has piled up to a depth of many thousand feet and formed a mighty *mer de glace*, (sea of ice) from which numerous glaciers pour down to the water's edge through the depressions called fiords. Thus, there is only a narrow strip of land along the coast which is free from snow and ice even in the summer. The people all live on the coast near the mouths of the fiords.

The boats used by the men are called kayaks. These consist of a light frame work of wood or bone, about twenty feet long and sharply pointed at both ends. Over this is tightly drawn a covering made of seal skins sewed together. The only opening in this cover is a round hole in the top just large enough for a man to insert his body. Buttoning his sealskin coat to the rim surrounding this hole, the kayaker is safe in his water tight compartment. With a single paddle flaring at both ends he sits bolt upright and propels himself with great ease and safety through the water, no matter how rough it may be.

Skillful kayakers can paddle eighty miles a day without great effort. If occasion demands, they can turn a summersault in their kayak. This they often do for the amusement of visitors, but still more often, when during storms, great waves with threatening white caps roll over them. When other boats would be filled with water and sink, the kayaker simply turns over and comes out right side up upon the other side of the wave. This however can only be done by skillful men. So easily is the kayak capsized that a European who ventures into one, even in smooth water, is pretty sure to turn over the first thing he does, and unless help is near, to be drowned; for it is not easy to pull oneself out of the kayak, even if he is not buttoned in.

The natives depend almost entirely upon their kayaks to reach the places where fish and seal and birds are to be caught. With their bone pointed spears and harpoons they noiselessly approach the game and succeed without firearms in capturing as many as they can carry home, and as they need. The danger is, however, so great, that about one-tenth of the deaths in Greenland are from accidents to kayakers. A great deal of heroism is required to get a living amid those inhospitable conditions. As is proper, when the men come in from their exhausting excursions to catch the game on which all depend for their food and clothing, the women take charge of it and prepare it for use. They dress the fish and skin the seal, and prepare the skins for being made into coats, and boots and boat covers. It is a merry time for the whole settlement when a good fat seal is towed into harbor. Slices of the blubber are freely given to the children, and every one goes away with his mouth crammed full of it, and a small piece in his hand.

The skins are freed from their oil and made pliable by chewing. This is done by the women, who bend the skin up in a fold inside out and munch it with their teeth until it is soft. When their boots become stiff and hard the women also chew them until they are pliable and then mend any holes that may have been worn in them. This work is so exhausting to the jaws that it is done only every other day. Naturally also it satisfies any craving they may have for gum, so that there is no demand for that article among the Eskimos.

### Population and Government.

There are about ten thousand Eskimos in Greenland, five hundred of whom, on the east coast, are still living in entire separation from contact with Europeans.

The rest, scattered in small settlements along the west coast from Cape Farewell to Upernivik, a distance of about a thousand miles, are under the control of the Danish government, and all have been converted to Christianity. Though, for the most part, living in the primitive conditions we have described, they are a contended and lighthearted people, and strictly honest and kind in their dealings with one another and with strangers. They can all read and write, and under the care of native chatechists they maintain Christian services upon the sabbath in their own languages, singing native hyms to good old German tunes. A few Danish missionaries make regular tours among them to perform marriages and to oversee the work of the teachers and the catechists. The doctor goes with the missionary, and if any are so fortunate as to be sick at the time of his visitation, they can have medical attendance free.

In the northern part of Greenland, during the winter, ice forms in the fiords and along the shore, so that the natives can travel freely over it. This they do with sledges drawn bydogs. There, for three or four months in the summer, the sun shines all the time, and during an equally long period in winter does not shine at all. But, in the absence of the sun, the moon makes her monthly visit and the aurora borealis lights up the sky so brilliantly that the season is by no means as cheerless as one would suppose. Here the houses are made of snow.

### Explorers of Greenland.

Only a few persons have ventured far upon the inland ice of Greenland. In 1860 Dr. Hayes went in about seventy miles from Smith's Sound, seeing nothing but snow and ice the entire distance. In 1883, Nordenskiold went in about two hundred miles from Disco Bay and brought back the same report of boundless wastes of snow and ice, unrelieved by a single mountain peak. In 1888, Nansen crossed the southern part, and in 1892 Lieutenant Peary crossed the northern part, for a distance of five hundred miles, finding upon the north-eastern side a fringe of coast free from ice, on which was an abundance of grass and flowers.

Here he killed musk-oxen to supply himself with food for the return trip, and his eyes were delighted with beautiful flowers and butterflies flitting about among them, while his ears were greeted with the ominous hum of the mosquito. But all these travelers agree in saying that the interior of Greenland, over an area extending fifteen hundred miles in length and from three hundred to five hundred miles in breadth, is completely covered with glacial ice, rising to a height of over eight thousand feet.

Thus, Greenland is the best object lesson now accessible to illustrate the conditions which prevailed over British America and the northern part of the United States during the glacial period. A few thousand years ago, the traveler would have found the border of this vast ice sheet as far south as New York City on the Atlantic coast, and as Cincinnati and St. Louis in the Mississippi valley. After seeing the glaciers of Greenland and the Eskimos who delight in its ice-bound coast, it is easy to believe what is told us about the glacial period, and about the hardy people whose flint implements assure us that man was in the world in those early and forbidding times.

---

## A VIEW OF EUROPE.

By Fannie E. Coe.

Let us take a glimpse of Europe as it is to-day.

First we will look at Switzerland from its highest mountain peak, Mt. Blanc.

Though in mid-summer, the air on this mountain top is cold and biting. The day is clear and the sky almost cloudless. A wonderful view is before us. To the east and west extend ranges of mountains which look like great furrows thrown up by some mighty plow. We see rising from these ranges many peaks, often of curious shape. Some are broad and irregular; others are wedge-shaped; and still others are slender as horns. The snow lies white upon the mountain heights, and the daily changes of the light are exceedingly lovely. Whether glittering in the noontide sun, crossed by blue shadows in the afternoon, flushing in the sunset glow, paling in the twilight, gleaming in the moonlight, at all hours, the Alps are glorious.

The mountain tops and sides appear smooth from a distance. A nearer view, however, would show them to be rough and broken by deep crevasses and dangerous gorges. Slowly down from their sides creep glaciers, melting and freezing alternately, and apparently trying in vain to hide themselves beneath a strange medley of rocks and earth scattered over their icy surfaces.

Below the snow line, on the lower slopes of the range, are green pastures. Dotted here and there on these breezy uplands, are sheep grazing near tiny chalets where the dairy farming is carried on during the summer.

Below the pastures come the forests, which appear like two belts. The blue-green belt of the evergreens runs above the yellow-green belt of the birches and chestnuts. At the base of the mountains lie the farms and vineyards.

Far to the north extends another principal range of the Alps, known as the Bernese Oberland, whose peaks we can faintly discern, while between these two Alpine ranges is the mountain valley of the Rhone River. Lake Geneva, like a blue turquoise, ornaments the western end of the valley.

In this valley and along the lake are quaint old towns. Here we find large hotels and the many small shops and trades that arise when swarms of tourists invade a region. Outside the towns are upland farms where people in rough homespun, with hats of coarse straw shading their brown faces, are harvesting and tending sheep. In their scanty leisure they carve toys and canes for the shops in the nearest town.

It seems a wide prospect that we have viewed today, though it hardly equals in extent the small country of Switzerland. The sky comes down on all sides and appears to cut off further view. Though we were on top of Mt. Everest we could see but little of the surface of this great sphere on which we live. The land all the while falls away from a perfect plain, and below the line of vision. In order to look upon such a stretch of country as Europe at one time, we would have to be many times higher than Mt. Blanc—more than a hundred times as high.

Let us in imagination suppose that we are raised to such a hight, and that our eyes are endowed with a power of vision more keen and far reaching even, than that of the greatest telescope on earth. As we rise, our circle of vision widens. From all sides come into view farms and dwellings, vineyards, fields, forests, villages and great cities. Here and there the rivers winding their way to the sea, and the net work of canals look like threads of silver. All are alive with boats. Railroad trains fly across the country in every direction. Life and activity are everywhere.

And so our field of vision grows until it reaches the limits of Europe. To the north is the pale blue Arctic Ocean, bordered and spangled with snow and ice. On the east are the pine covered Ural Mountains with their rich stores of yellow gold and green malachite. On the south rolls the peaceful Mediterranean, while on the west our view is stopped by the rising mists of the wide Atlantic.

From the Alps the land slopes away on every side. A vast plain stretches northward and eastward with a very gradual decline toward the ocean. The southern slope toward the Mediterranean is more abrupt.

Now for a closer and more careful view.

Looking toward the north west, we behold the glorious River Rhine rushing, sauntering, creeping to the sea. Germany, Holland and Belgium are the countries our eyes rest upon.

The shores of the central course of the river are bordered by the nearly perpendicular vineyards. The purple and white grapes are hanging in luscious clusters from the poles. Peasants in coarse homespun, with faces changed by the sunshine to a rich brown, are toiling up the almost vertical paths. Sometimes they are obliged to creep on their hands and knees, the paths are so steep. They carry straw baskets and are gathering the grapes and taking them to the village at the foot of the hill. There all the people are out doors, pouring the grapes into huge tubs and treading upon them in order to press out the rich juices. They seem happy in their toil, with the afternoon light flooding the land and the lapping of their home river in their ears.

The heights along the Rhine are crowned with ruined castles and towers. Here and there a fortress frowns down upon the river or upon the peaceful fishing-town nestled at its base.

The course of the Rhine is broken occasionally by waterfalls or whirlpools. Fishing boats of very quaint pattern with picturesque dark sails plod slowly up and down the river. They move faster than the log rafts, but not so swiftly as the brightly painted steamers. Frequently the river passes a large town above which tower the lofty spires of some world-renowned cathedral. These towns are graced by statues of the famous poets, musicians and statesmen of Germany.

In this country lived the great writers Goethe, Richter and Schiller, and many of the most noted musicians, philosphers, mathematicians and scientists of the world. Germany was the home of Humboldt and Ritter, the founders of the science of physical geography.

That gay patch of land west of Germany is the small country of Holland. Its coast is bordered by huge grass-grown dykes against which the restless ocean beats, eager to reclaim the lowland within. The land is velvety green, laced with silver canals. The houses are bright red, blue and yellow, and have curious peaked roofs, set with flashing weathervanes. On the doorsteps every morning may be seen women scrubbing the flag stones with energy.

Cleanliness and liberty awaken the Dutch to enthusiastic action. The men of broad backs and broad faces, whether working in their rich warehouses, or on their fine docks, or discussing matters of trade in their ancient guild halls, are always smoking.

The neighboring country of Belgium is much like Holland. It also has canals bordered by willows and poplars, sand-dunes overgrown with coarse grass, and red and yellow windmills thatched with straw.

Occasionally the shore is strengthened by sea-walls and break-waters. Here there is apt to be a watering place. People recline in beach chairs beneath great straw hoods that protect them from the sun, or bathe in curious bathing machines which are dragged by attendants out into the sea.

We now look due north and our eyes first rest upon the sombre pines of the Black Forest, trees that sigh and moan with every passing breeze. Beyond, rise the ancient towers of Nuremburg, and still farther north are the Hartz Mountains.

These low German Mountains are pierced with many a deep mine; and smoke from the fires of the charcoal burners rises from their slopes. The dwellers here are rude peasants, but like those in the Black Forest they believe and tell legends concerning their hills and woods that are both fantastic and beautiful.

In the lowlands north of the Hartz Mountains are several commercial cities. The chief of these is Hamburg, which is washed by the river Elbe. In this river ships and steamers that have weathered the storms of the five oceans lie at anchor, under the protecting shadow of the tall, tall spire of St. Nicholas.

Beyond Hamburg the land, always growing lower and flatter, runs out into the peninsula of Jutland. Next to Holland, Denmark has the lowest land in Europe. Dreary bogs and sand wastes cover much of the surface of Jutland. Still there is a fair amount of fields of grass and heather, where remarkably fine cattle and horses find pasturage.

East of Jutland is a confused jumble of large and small islands and of blue straits and channels. The greener grass and the luxuriant forests of birches and beeches show us that this is the more fertile part of Denmark. The clouds of smoke rising in several places prove the islands to be the more thickly settled region. Copenhagen, the capital, was the home of Hans Andersen, the gifted writer of fairy stories, and of Thorwaldsen, the great sculptor. It is made up of so many bits of islands and seas that it has been called the Venice of the North. In its many canals, curious tall houses, and masts rising in the midst of chimneys, Copenhagen resembles the cities of Holland. It is distinguished from other cities by its fine Thorwaldsen Museum and Rosenborg Castle.

In the far north is Scandinavia, the peninsula of fiord and forest. The west coast is broken by numerous bays, or fiords, running far inland. The water in these fiords is perfectly smooth, so that they reflect, as in a mirror, the lofty cliffs, clothed with evergreen trees that border their shores. Down the hillsides dash cascades and mountain brooks. The shores of the fiords are quite lonely. On some of them the birds are the only signs of life. On the shores of others, however, there are small villages, or perhaps an inn, where travellers may stop for the night. Rains are very frequent along this coast.

The fiords and the channels among the Lofoden Islands abound with fish. Many of the towns send out their fleet to the cod and herring fisheries. When the short, wide boats return heavily laden, the village fish markets are the scenes of brisk trade.

North Cape is a great rock a thousand feet high, rising out of the cold Arctic Ocean. Sea gulls soar and scream around and above it; and for the greater part of the year they are the only signs of life. In the short summer, however, steamers bring tourists to the North Cape to witness the wonderful midnight sun. It is a memorable day when one sees, for the first time, the bright sun trace out the circle of a day of twenty-four hours on the sky, never once disappearing below the horizon.

The scenery of Scandinavia is so picturesque and wild, and the air on the breezy uplands so invigorating, that tourists are now seeking Norway and Sweden as they would Switzerland. So as we look we see vessels steaming toward North Cape or rocking in its shadow, and rows of little carriages drawn by donkeys, hurrying along the good country roads from one quaint Norwegian village to another.

Looking at Sweden, we see that the northern half of that country is thickly clothed with forests. The cities are massed in the southern part. That silver gleam extending from Stockholm to Gothemburg is the Gotha Canal. This is quite a triumph of engineering skill. A sail through it gives one an idea of the quiet, peaceful scenery of Sweden, as contrasted with the wilder and more rugged aspect of Norway.

If now we turn our attention to the north-east and east, we behold the enormous country of Russia. The larger half of Russia we do not see, for it is in the neighboring grand division of Asia, but European Russia is larger than all the other countries of Europe combined.

Much of the interior of Russia is covered with forests. For miles and miles the pines and furs stretch away their close ranks. Not a road, a farm, a rude clearing breaks their compact lines. The trees are so tall and straight that the woods seem to have been growing for centuries.

When the forests give way, their place is taken by the wheat fields. The wind, leaving the Black Sea, ripples wheat fields in its progress until it reaches the slopes of the Ural Mountains. The wheat heads appear largest and fullest in the rolling plains of southeastern Russia. These plains are known as the steppes, and their rich soil is most favorable for the growth of grain.

Southeast of the grain region, along the shores of the Caspian Sea, are dreary deserts of salt and sand. Over the Caspian Sea are plying steamers that are engaged in the oil trade.

The people living on these vast plains nearly all belong to two classes. They are either poor peasants or the owners of wheat or sheep farms. In the latter case we see their large, rambling establishments consisting of houses, barns, stables, greenhouses and mills, standing in the midst of a farm of thirty thousand acres. The farms, like the whole country, are built on a generous plan.

The plot of land owned by the average peasant is but an acre. It is rarely well cultivated, and the cottage has a slovenly appearance. The peasant is a dull, helpless, hopeless person, because he sees almost no opportunity for bettering his condition.

In the west is St. Petersburg, the city of the Czar. The churches with golden domes and spires and fine blocks of stately palaces border the Neva River. That great oblong building of brown and yellow stucco-work is the Winter Palace, one of the residences of the Czar.

The life of the Russian capital seems to center at the Neva River. In the winter there is much skating, coasting, and a great deal of sleighing upon the icy surface of the Neva. The queer Russian sleighs, or droskies, have oddly dressed drivers seated on high boxes, and are drawn by one, two or three horses. These horses have a very light harness. The only heavy-looking article of harness is a wooden bow arching over the neck, to which the traces are fastened. You can hardly imagine how fast these horses go.

It would be delightful, some starry winter night, to wrap one's self in the piles of fur rugs in a drosky and go flying down one of the fine boulevards that run parallel to the river. The horses dart ahead like arrows. The driver keeps cheering them on, although they need no urging. The frosty air is so sharp that now and then one is forced to hide his face in the furs. On the shore of the river the brilliantly lighted palaces show that many balls and dinner parties are taking place. All seems to be happiness, within and without. The Russians never tire of these winter amusements.

The severe Russian winter presents its gayest side to St. Petersburg. It is to the peasant on the lonely inland plain that it turns its grim and most savage aspect. For months the deep snow cuts off the family from intercourse with their neighbors. They husband their small stock of provisions with care, and spend many hours by the huge, flat Russian stove. Perhaps they are dreaming of the distant summer. It almost seems to them to be at hand, when the howl of the wolf recalls them to realities again.

South-east of St. Petersburg we see green and gold Moscow. With its oddly colored Kremlin towers, with its walls and its gateways, it appears more like an Asiatic than a European city.

Farther east is Nijni Novgorod, the place of the annual Russian fair. The River Volga and its tributaries form the water highways on which buyers and sellers from all countries of Europe and Asia flock to the fair. The strip of land outside the town which serves as the fair grounds, is very carefully laid out into straight streets and crossways, along which are ranged the white-walled shops. Everything imaginable may be bought here, from diamonds and brass samovars, to leather, and salt fish. The costumes, complexions and tongues that are seen and heard here suggest the possibility that the builders of the original tower of Babel have been collected again.

Now let us turn our faces due east, toward Austria and the Danube provinces. Nearest us is the Tyrol, with its peaks of dolmite rock and its lower alps, where cattle wander, and where the delicate alpenroses and edelweiss bloom. On the Alps may be seen the dairy chalets where overhanging roofs are held in place by large rocks. Much of central Austria consists of level plains where herds of cattle pasture. To the south are fine wheat regions. The "beautiful blue Danube" River intersects Austria and Hungary. It can only be called blue in its upper course, for below Buda Pesth its water is yellow, owing to the quantity of mud it carries along.

Vienna gleams in the sunshine on the shore of the Danube. It is a city of great beauty, and the scene of much joyous life. The drives, the parks, the beer-gardens, the opera houses and theaters, the gay throngs of people, the bursts of music from the band, make Vienna seem only less gay than Paris itself. This stately city, with its broad streets and handsome buildings, is a great medical and musical center. It is also extensively engaged in the grain trade.

Buda Pesth, the capital of Hungary, is a beautiful city with fine wharves and arching bridges. But many of the towns and villages of Hungary are not attractive because they are not clean.

If now we turn and face southern Europe, we behold three peninsulas extending into the crisp blue waves of the Mediterranean Sea. The most eastern of these peninsulas contains the countries of Turkey and Greece.

There are very few railroads in this peninsula, and the roads are exceedingly rough and poor. The whole territory seems inacessible and remote from the rest of Europe. It seems strange that the Turks, people who really belong to Asia, should have and hold the city of Constantinople, a city that occupies a situation finer than that of any other large town in Europe. Half in Europe, and half in Asia, separated into three sections by the narrow Bosphorus and the lovely Golden Horn, built on seven hills, crowned by the domes and minarets of Mohammedan mosques, Constantinople from a distance is enchanting.

A nearer view of the city destroys the illusion. Narrow, badly paved streets, thronged with beggars in tattered garments, and ravenous, wolfish looking dogs, wind up the hillside. The mosques are imposing, but far from clean. They cast a grateful shade across the squares, thronged by Turks in turban or fez, kilted Greeks and Persians in tall astrachan caps.

Greece is a country of beautiful mountains, lovely plains, groves of cypress and olive trees, ancient forests, sunny corn-fields and ruins shrouded in roses. Not all the ruins, however, are so kindly treated.

The brown marble columns of the Temple of the Wingless Victory, the Erectheum, and the Parthenon on the breezy platform of the Acropolis at Athens are free from the mantling roses and ivy. The sea breeze lifts the dust from the plain and whirls it against the carved shafts and bas reliefs, perfect even in decay.

Italy, the central of the three southern peninsulas, is well-nigh the most interesting country of Europe. The natural attractions are great. The climate is mild, the skies are bright, and the whole land is steeped in almost constant sunshine.

The Italian cities are very old and famous. The streets are usually narrow and paved with blocks of lava. They are also dark, because they are shaded with stone buildings seven or eight stories high. These buildings are so packed with people that much of the life overflows upon the streets, where grown folks and children eat, cook, gossip, doze, spin and knit.

We can merely glance at a few of the cities of Italy, as we tell their glorious names. Here is Milan with its exquisite cathedral of dazzling white marble, with windows of stained glass in which seem to be stored all the sunbeams of past ages.

On the west coast stands Venice, the city of islands and lagoons. Here graceful, dark gondolas glide through narrow waterways bordered by crumbling marble palaces, or shoot into the bright waters of the grand Canal with beautiful St. Mark's in full sight.

Further south is Florence on the Arno River. It has pictures and statues of priceless value that are stored in the Pitti and Uffizi palaces. These palaces stand in the midst of lovely gardens where lilies and roses border the velvet lawns on which, here and there, fountains are playing.

Rome, the most celebrated city of Europe, is situated on the Campagna. This is a wide desolate plain, crossed by the old Roman roads and an occasional aqueduct. The Campagna is quite unhealthy, owing to the malarious gases which rise from it, and strangers avoid it, particularly at night.

The yellow Tiber divides the city into two parts. We see St. Peter's and the Vatican, the residence of the Pope of Rome, on one shore, and the Coliseum and other ruins of ancient Rome on the opposite shore. St. Peter's, with its vast spaces, mammoth pillars, and tremendous dome, might be called the eighth wonder of the world. It is the largest cathedral in Europe.

The Coliseum is a huge building where the gladiator and wild beast contests once took place before the emperor of Rome. It is now a vast gray ruin, the greatest ruin in Europe.

Naples is a paradise upon earth so far as climate and scenery are concerned. It is built on the crescent shaped shore of the beautiful Bay of Naples. The dark cone of Mt. Vesuvius frowns down upon the white roads overhung with grape vines and bordered by richly laden orange, lemon and fig trees. The light hearted Neapolitans bask in the sunshine, play on their mandolins, or stroll along the shore with dreamy faces fixed upon their exquisite bay.

If Turkey is Asia in Europe, Spain is Africa in Europe. The dry and barren plains, the cacti and prickly pears growing on the slopes of the hills, the clouds of dust that whirl through the air, all remind one of the desert plains of North Africa. The lofty mountains are covered with snow, and from them, by means of aqueducts, the city fountains are supplied with water.

The houses in Spain are square and solid. They have flat roofs and are built around a courtyard. This courtyard is shaded by an awning, and has a fountain or deep well of cold, pure water in the center. A few orange and lemon trees grow in the garden and help to form a delightfully cool and shady retreat, where one may while away the noontide. The heat then is so great that everyone takes a nap, and walks and drives in the cool of the day. On nearly every summer evening one sees the fashionable men and women promenading in the park or along the river shore. The men wear broadcloth cloaks lined with velvet, and tall silk hats. The women have rich dresses of black with elegant lace scarfs thrown over their heads. They carry fans and wear dark red roses in their hair.

Bull fights are the chief recreation of the Spaniards. Men, women and children of all ranks of society gather in the amphitheater to see bulls tortured by men, either on foot or on horseback, armed with spears, darts and swords.

The Alhambra, near the city of Grenada, once the palace of a Moorish king, is one of the most exquisite buildings in Europe. Its stately corridors and halls, its shady courtyards, and its sunny gardens are a source of constant interest and delight to the travellers. The palace walls are covered with stucco-work, so fine that it resembles carved marble. Portions of this stucco-work are colored and gilded so brightly that they present an oriental appearance. The windows and balconies of the palace command the Vega, or plain of Grenada. The view is wide and unusually beautiful.

Portugal, the sister country of Spain, resembles it in climate, productions, and customs of its people.

North of the Pyrenees mountains is France, the gayest country in Europe. It is not that the people are better than any other people of Europe, or that they enjoy more advantages. It is that they are of a more radiant and demonstrative temperament.

They have a beautiful, mild climate and much of their life is spent out of doors. This is true, not only in the country, but also in the city.

In Paris, everything encourages this out-door life. There are wide boulevards circling through the city, bordered by shaded sidewalks and decorated with occasional statues, fountains and flower-beds. Here people drive and walk, here they examine goods in the richly stuffed shops along the way, or sip coffee outside the little cafes and gaze at the passers-by.

There are public parks both inside and outside the city. The Tuileries Gardens with their straight walks and set flowerbeds and clusters of trees are the resort of children and their nurses at certain hours of the day. The Bois de Boulogne, outside the city, is the destination of much of the fashionable riding and driving from Paris.

The landmarks of Paris from a distance are the tall, elegantly carved towers of Notre Dame and the gilded dome of the Hotel des Invalids. Below that gilded dome is the tomb of the great Napolean Bonaparte, whose remains were brought from St. Helena in 1840 and deposited there amid great display.

The French coasts are interesting and picturesque because they are dotted by many fishing villages. The low, sandy shores are thronged by women and girls in short skirts and bare feet. They carry nets and baskets which they fill with mussels or shrimps.

Central France has many vineyards, and is crossed by white roads bordered with poplars and leading to gray old stone cities. In these cities splendid palaces may be seen rising beside grimy cottages.

The marshy and sandy tract just south of the Gironde River is known as the *Landes*. The people of this region are shepherds and usually go about on long stilts.

France is also noted for its many eminent writers and scholars.

Across the narrow seas to the north of France are the British Isles. Ireland is the land of peat-bog and lonely lake, of mouldering tower and thatched hovel. The mists of the Atlantic keep the vegetation a rich green. The tree trunks are covered with ivy, ferns crown the walls, and fox-gloves, bog-myrtles and shamrocks border the roadside. The women in their picturesque cloaks or shawls stand outside their white washed stone houses and bare footed children patter through the narrow flagged streets. Dublin is a fine city.

In this country was born the poet Moore, and the famous orator, Edmund Burke.

Scotland is a wilder country than Ireland. The soil is poorer and the vegetation is far from being as luxuriant. Scotland has moors of yellow broom and hill-sides where the purple and brown heather and silvery green bracken wave in the breeze. These rocky hills, under the varying lights and shadows of the passing clouds, are unspeakably lovely. Remote mountain lakes, lovely glens, dashing torrents, wooded or rocky islands, quaint villages and historical cities checker Scotland.

The masts of ships that are being built in the ship yards on the Clyde River rise amongst the tall chimneys of Glasgow. To the east are the crags of Edinburgh, one of them crowned with the famous historic castle, which overlooks Princes St. Gardens and fair Holyrood Palace.

Scotland was the home of Robert Burns and Walter Scott. Who were they?

England, though less wild and picturesque than Scotland, is very beautiful in its quiet way. The hedge rows where sweet wild flowers grow, the curling streams, fair country residences, peaceful towns and stately cathedrals with bells chiming the hour, are very attractive.

The black belt or region of north-central England where furnaces glow and tall chimneys cast clouds of smoke into the air, proves her to be a great manufacturing country. As for the commercial cities, behold Liverpool and London! London with its art galleries, museums, libraries, statues, St. Paul's and Westminster Abbey, is of supreme interest to an American.

England has produced a long list of great mathematicians, philosophers and scientists. No other modern nation can present such a galaxy of writers—Chaucer, Spencer, Milton, Byron, Dryden, Pope, Addison, Johnson, Wordsworth and Shakespeare ("the greatest creative genius that ever lived"), would reflect glory on any age.

It is on England, our old home, that our eyes last rest before taking leave of this wide and interesting prospect.

### Our Own Country.

As we contemplate what Europe was and is, it will be pleasant to consider that our own country has been its direct and most favored heir in all things that have proved useful and uplifting in its civilization, and valuable in its arts, while many of the old customs and usages which only hamper and retard are discarded; that no nation of the earth is more prosperous, progressive, or powerful than our own; and that in no other country is there such comfort and independence among the masses, such perfect political and social equality, and such an opportunity for all to rise from the humblest station to the very highest in every calling.

## COMMERCE.

In the savage state men desire little more than food, drink and ease. But as they grow in civilization, their tastes become refined and their wants increase. They think more about the comforts and pleasures of life and the means necessary to secure them. The savage needs but few things,—the bow and arrow, the spear, a few rude implements,—all of which he can make himself; while the civilized man wants many things,—good tools, clothing, furniture, pictures, books, etc.,—things which he has neither the time nor ability to produce alone. So, instead of making every article one needs in a civilized community, it has been found necessary for some to make tools, others clothing, others furniture, etc., and then for each to exchange the things he makes for the things he needs. In this way only can all be well provided for. *Thus variety of industry, and commerce itself began.*

Money.—As men cannot always exchange their products for what they want in their own community, or directly, it has been found convenient to *use some substance as a medium of exchange, measure of value. Such a substance is called Money.*

Articles Used as Money.—Various articles have served as money at different times.

Opium is so used now in many parts of China. Furs were used as money by the Hudson Bay Company, and "wampum" (ornamental beadwork) by the early Indian tribes.

Gold and silver are used as money among all civilized nations, and they are found to be more suitable and convenient for such purpose than any other substances known.

Bank notes and drafts, or checks, *represent money, but are not money*. People take them in exchange for articles on account of their convenience, and because they have confidence that the makers of these notes and checks will pay coin for them whenever asked to do so.

In large exchanges of goods between cities of the same country, or of different countries, money is seldom used *except to pay balances*.

Export–Import.—People *export* only such things as they produce most easily and in excess of their needs, and *import* the things they can buy cheaper than they can produce, or such things as they cannot produce at all.

Formerly goods were transported in sailing vessels and on backs of animals, as is done at the present time in deserts and in some mountain regions. Now, steamboats and railways are the chief means of transportation. Persons or corporations engaged in the transporation of goods for the public are said to be "*common carriers*."

To Aid Commerce.—Men have built common roads and railways everywhere on land, constructing great bridges and viaducts, even passing over lofty mountains or running through them; they have filled the sea with ships of wood and of steel, enlarged rivers and harbors, built massive piers, marked out safe channels by beacons and buoys, stationed light houses at dangerous points along every coast, planted scores of life saving stations, published charts of navigation, indicating the routes of travel and points of danger, and established weather bureaus which give warning of approaching storms; they have dug canals, built large factories and warehouses, produced many and valuable labor saving inventions, held great international fairs in various parts of the world, located consuls at every important commercial city in other lands, established post-offices and newspapers everywhere, covered the land with telephone and telegraph wires, and bound continents and islands together by ocean cables.

*To protect commerce*, as well as to preserve peace and enforce the laws, nations maintain large navies and standing armies.

The Atlantic, The Great Thoroughfare of Commerce.—The principal commercial countries border on the Atlantic Ocean and its arms, thus making it the greatest thoroughfare of travel and traffic in the world. Its waters are constantly plowed by myriads of vessels plying between marts of trade on either shore.

The commerce of a country depends on its Natural Resources, (its fields, forests, mines and fisheries), on the *extent and activity of its industries*, and on its *means of transportation.*

RAW MATERIAL.—*Raw material* is the ore in the mine, the timber in the forest, the grain in the field. The *finished product* is this raw material *changed by labor* into articles useful to man.

FINISHED PRODUCT.—The finished product of one class may be the raw material of another. Wool is the finished product of the farmer, but the raw material of the weaver. Again, cloth is the finished product of the weaver, while it is the raw material of the tailor.

Some products, such as fuel, require but little labor to fit them for use, while others demand much labor and a long series of processes. Articles of the latter class are all the while going from the fields of production to the places of manufacture, and then are distributed to various parts of the country or world, for consumption.

Much of the trade of a nation is composed of small sales of the necessary articles of food, such as garden vegetables, dairy products, etc., in the immediate neighborhood of their production, and of which no account can be taken.

TARIFF OR DUTY.—The commerce and industries of a country may be affected by its laws. A country may impose a tax on imported goods, called a *duty or tariff*, either to raise money with which to carry on the government, or to encourage the home production of these articles. The first is called a *Revenue Tariff*, and the second, a *Protective Tariff.*

Sometimes, instead of imposing a tariff on the competing articles, a nation encourages its industries by a direct payment of money, called a *bounty*. Government aid to a steam-ship line and railroads is called a *subsidy*.

INTERSTATE COMMERCE ACT.—The United States enacted a law in 1887 which especially affects domestic commerce—the Interstate Commerce Act. The Interstate Commerce Act requires all railroads which operate lines in more than one state to make uniform and just rates for carrying goods—charging a higher proportional rate to one town or individual than to another being unlawful. A commission of three persons hears and tries all complaints of offenses against this law.

(The Commercial Reciprocity Act of 1890 is a recognition of the principle that the United States may make treaties with other nations allowing certain articles, usually raw materials, to be admitted free of duty, or for a small duty, on condition that specified articles shall be admitted into those countries on similiar terms.)

## Products Most Useful to Man.

The products most useful to man include all the great articles of commerce and many besides, and may be classified as *Food Products*, *Clothing Products*, *Mineral Products*, and *Miscellaneous Products*.

### I. Food Products—Vegetable.

*Wheat* is the great food-grain of civilized nations, and the most widely diffused of all the cereals. Like other cereals, it is a grass plant, and originally grew wild, though its cultivation as a food plant antedates all history. Wheat was used by the Chinese and by many people of Asia and Europe long before the Christian era. The original home of this grain was probably in Asia—some believe in the valley of the Euphrates River. From there it spread to other parts of Asia, to Europe, and later to America.

Wheat grows in the highlands of the tropics, but thrives best in the Temperate Zones. The finest quality of wheat and the most famous wheat fields in the world are in the valley of the Red River of the North, in Dakota, Minnesota and Manitoba. The rich soil of this region furnishes the proper nourishment, and the long summer days the needful light and heat for its complete development, especially of that variety know as "No. 1 Hard."

The grain is sown in the spring ("spring wheat") or early fall ("winter wheat") and ripens the following summer. In the United States the most improved machinery is used in preparing the ground, in "seeding" and in harvesting the grain.

Seventy-five years ago all grain was sown by hand, cut with sickles, and threshed with flails, or trodden out by animals.

In the United States, after the grain is harvested and threshed, it is carried in sacks to mills to be ground into flour and then distributed for local use; or transported by cars or steamers. Sometimes the grain is taken to the large trade centers and stored for a time in immense warehouses called grain elevators, and then shipped abroad.

Most of the wheat exported from the Pacific States to Europe is carried around Cape Horn in sailing vessels.

The United States, Russia, Germany, Austria, India, Argentine Republic and Chile are the great wheat exporting countries.

In 1890, the United States exported wheat and wheat flour to the amount of over $100,000,000.

*Maize, or "Indian Corn"* is the grain, or seeds, of a large grass plant native to America. It was the only grain cultivated by the early Indians, hence the name, Indian corn.

Corn yields about twice as much per acre as wheat does, but requires a warmer climate. The southern and central states produce corn in greatest abundance.

It has spread over large portions of the world and, next to rice and wheat, is the most important food plant grown. For fattening cattle and swine it is superior to all other foods. Much of the corn produced in the United States is consumed in this way on the ground where it is raised.

Large quantities of starch, glucose and spirits are made from corn.

Most of the corn of commerce comes from the United States, the exports in 1890 amounting to $50,000,000.

Corn is usually planted in hills from three to four feet apart and carefully cultivated. It ripens in the fall, when the ears are "husked and cribbed." It is then shelled and ground into *meal* or fed on the ear to horses, cattle and hogs.

*Rice* is the most important grain plant of the tropices and sub-tropics. It is the cheaf food of the Chinese, Japanese, and natives of India, southeastern Asia and the adjoining islands, and grows best in the countries of these people.

Rice grew in China and India in remote antiquity, and spread from thence to other parts of the world. Lowland rice needs, for successful cultivation, a warm climate and a low, rich soil which can be readily flooded with water; but upland rice grows on dry land the same as other grain. After the lowland rice is sown, the ground is usually flooded until the seeds sprout. The water is then drawn off, but the ground is again flooded when the stalk forms a joint, and is kept flooded until the grain ripens. The rice is then cut, threshed, winnowed and put in sacks for the mill or market. Special machines are necessary to get rid of the inner covering of the rice grain, which adheres very closely to it. Sometimes the rice plants are transplanted after they are sprouted, and the ground flooded an extra time to kill the weeds.

The finest quality of rice is grown in the southern coast states, especially in North and South Carolina and Louisiana, but not enough for home consumption. The United States imports rice largely from China and Japan. Most of the rice is consumed in the countries where grown.

*Oats*, *Barley* and *Rye* are other important cereals. They are more hardy than wheat, but produced in about the same manner. They all probably originated in Asia.

*Oats* are grown in great abundance in Russia, Canada, and the United States, and furnish the most valuable food for horses.

*Oat-meal* is a staple article of food in the United States, Canada, and European countries.

*Barley*, the hardiest of cereals, is raised in the United States, Canada, Russia, Germany and Austria, mostly for brewing purposes, though it was formerly used entirely for food.

*Rye* is grown in Germany and other countries of northern Europe, and in the northern portion of the United States as a bread plant.

*Millet* is a small grain, native of Asia, which is grown in large quantities in India, Siberia and other parts of Asia for food. A special variety of this plant is grown in the United States for forage.

The *Potato* is a tuber, or an enlarged portion of the underground stem of the potato plant, and is composed mostly of starch. It is a native of South America and was carried to Europe by early Spanish explorers. It is now one of the principal food plants of most civilized countries, and especially of Ireland, where it was early cultivated, and whence the name "Irish potato." It thrives best in the middle temperate zone.

The *Sweet Potato* is in no way related to the Irish potato. It is a climbing vine of the morning glory family. The sweet potato is the enlarged root or tuber of the plant, and serves as a store house of starch and sugar. It is a native of the warmer regions of both hemispheres, and has been cultivated from the earliest times.

*Yams* are vegetables much like the sweet potato, but larger and coarser, some weighing thirty pounds or more, each. There are many varieties growing in most of the countries of the tropics, and they furnish food for a large number of people.

*Manioc*, or *Cassava*, is a plant whose large, starch-filled roots are used as a chief article of food by the natives of tropical America and Africa. The plant grows wild in Brazil, and is believed to have originated in tropical America.

The root is pounded or grated, and then carefully washed in water to take out a poison in the sap. It is then heated until the grains swell up, forming the *tapioca* of commerce.

*Sugar*, though found in many plants, is obtained mostly, and in about equal quantities, from the sugar-cane and the sugar-beet. Five hundred years ago sugar was unknown in Europe, or used only as a medicine, or in place of honey to prepare it. Now it is almost a universal food.

Sugar-cane, a grass plant, somewhat resembling corn, is a native of southern Asia. From thence it was carried to America, the West Indies and the Sandwich Islands.

In tropical regions a sugar-cane plantation sometimes lasts ten years, but in the United States, and like cool countries, the cane must be planted as often as once every two or three years. It is not grown from the seed, but from pieces of the cane which are planted.

When ripe the stalks are crushed between rollers to extract the juice, or they are sliced or shreded and treated with hot water. In either case the liquid is evaporated in pans over a fire. The syrup thus formed is allowed to crystalize. The uncrystalized portion is drawn off as molasses. The crystalized part is the "brown" or *raw sugar* of commerce.

Sugar refining is a complicated process. The raw sugar is first dissolved in hot water, filtered through cotton and animal charcoal, and then evaporated. The *vacuum-pan* and *centrifugal filter* are important inventions used in refining sugar. The vacuum-pan enables the syrnp to boil at a low temperature, as the air is partially removed from over it. The centrifugal filter is a perforated cylinder from which the water and molasses are expelled by its rapid motion, leaving only the granualated sugar behind.

The great refineries are located (for the most part) in the sea port cities. Brooklyn, Boston and Philadelphia have large refineries. Beet sugar is made in about the same way as cane sugar.

In 1890 the United States imported nearly $100,000,000 worth of raw sugar, one-half of which came from the West Indies. The Sandwich Islands and East Indies also furnish large quantities. The sugar cane thrives best in tropical and sub-tropical countries. It is grown with success in Louisiana and other southern states.

The sugar-beet grows in the temperate zone and is an important production of central Europe. Beet sugar was discovered in Germany in 1747. Napoleon first gave it great prominence in France by bounties, and its culture extended into other European countries. Germany, France, Belgium, Austria, Russia, Holland, in order named, are the leading beet sugar producing countries. California and Nebraska have made a beginning of the industry in this country. An acre of beets produces about 4,000 pounds of sugar, while an acre of cane yields about 7,000 pounds. The quality of the sugar is about the same in each.

*Maple Sugar*, made by evaporating the sap of the maple tree, is produced in limited quantities in New England and other northern states and Canada.

This sugar is especially prized on account of its pleasant flavor.

*Sorghum* is a sugar plant resembling the sugar cane but not as valuable. Its product in the United States is mainly in syrup. One kind of sorghum is the broom corn, from which brooms are made.

A kind of sugar called *glucose*, is extensively made from the starch of the potato in Germany and of corn in the United States. Germany leads in this production. The common syrups are largely composed of this material. The total sugar product of the world is over five million tons.

*Tea* is the dried leaves of the tea plant, an evergreen shrub which grows in China, Japan, portions of India, southeastern Asia, and neighboring islands.

In the wild state the plant reaches the height of 25 to 30 feet, but when cultivated it is kept pruned and is seldom over five feet high. The plant is raised from the seed and begins to bear when three years old. It reaches maturity in about nine years, after which it bears less and less, and a new plant is set out in its place. It produces from 100 pounds to 200 pounds per acre.

The plant needs a warm, moist and equable climate, and a rich soil for the best growth of leaves.

There are four gatherings of leaves each year—in April, May, July and August. The first crop makes the best tea; the second crop is the largest; and the last crop the poorest, on account of the coarse quality of its leaves.

When picked the leaves are dried and roasted, a different method of preparation producing the two varieties known as "green" tea, and "black" tea. Green tea is made by drying the leaves quickly; while in making black tea the leaves are allowed to dry more slowly and ferment a little, thus causing them to turn black. In the process of preparing the tea for the market the leaves are rolled by hand into the shape we see them.

"Brick tea," formed by compressing the leaves into blocks, is used as a food by many of the people of central Asia. Siberia imports large quantities of it from China.

It is estimated that more than one-half of the human race use tea as a beverage. The Chinese drink the tea clear, and never with milk or sugar.

In China the tea is generally cultivated on small farms, and the leaves are picked by the family. During the harvest season family groups may be seen on all the hillsides gathering the leaves in small bamboo baskets which are slung by a cord around the neck. For foreign trade, teas are packed in boxes or chests, lined with thin sheet lead to make them impervious to air and water, in order that the aroma and freshness of the tea may be preserved. As the tea is put into the box a man stamps it down with his feet until the box is completely filled, when the lead is soldered over it and the cover fastened on.

The tea plant is a native of Asia, and has been cultivated in China farther back than history goes. It was first brought into Europe by the Portuguese, in 1517.

The island of Formosa is said to produce the best tea.

China consumes four-fifths of the 2,400 millions pounds it produces, Great Britian 165,000,000 pounds and the United States 55,000,000 pounds.

The United States imported $12,000,000 worth of tea in 1890, mostly from China and Japan. Canton is the great Chinese tea port.

The *Coffee* plant is a tropical evergreen tree which grows wild in Abyssinia, and on the Guinea and Mozambique coasts of Africa.

Coffee is believed to have been first cultivated in Persia. The Abyssinian variety has been acclimated in many other countries, and most of the coffee of the world now comes from regions where the plant is not indigenous.

Some of the South American countries, especially Brazil, are well adapted to its cultivation.

The plant needs a warm, moist climate, and careful cultivation. It sometimes grows to the height of 25 to 30 feet, but is usually pruned down to about five feet, in order to make it more convenient to pick the fruit. The tree is grown from the seed. It commences to bear at three years old and keeps on bearing almost continuously for more than twenty years. The flower and the ripe fruit may be seen on the tree at the same time. The fruit is usually gathered two or three times a year.

The coffee of commeree is the seed, or "beans," of this fruit, which is an edible berry, much resembling the cherry in size and general appearance. Each berry contains two seeds, the "coffee beans," lying with their flat sides toward each other, and covered with a tough membrane, or husk.

In preparing the coffee for market the pulp is removed and, after drying, the husk also. The coffee seeds are then assorted and put into bags for shipment.

The finest coffee in the world, called Mocha from the port of shipment, is raised in Arabia. The Java coffee ranks next. Brazil furnishes half the coffee used in the world and nearly all used in the United States. In 1890, the United States imported nearly $80,000,000 worth.

Coffee grows well in both West Indies and East Indies, and is an important production of these and other tropical countries.

*Cocoa* comes from the cocoa-tree of the West Indies and tropical America. The tree grows about 15 or 20 feet high, and bears long pods, containing thirty or forty seeds each, from which the cocoa is made. These seeds are ground to powder between heated stones and the oil afterward pressed out. This powder made into a paste is called *chocolate*.

The finest cocoa is produced in Venezuela. The largest crop comes from the island of Trinidad.

*Spices* (pepper, cinnamon, nutmegs, cloves, etc.) are tropical products, and were the most important articles of trade of the East Indies in early times.

*Black Pepper* is the dried fruit of a climbing shrub, originally a native of India, but later introduced into the islands of the East and West Indies.

("The high price of pepper during the middle ages led to the discovery of the Cape of Good Hope in the endeavor of the Portuguese to reach the Indies by sea.")

*Cinnamon* is the bark of a small tree, native of Ceylon. It has been introduced into most of the tropical countries of the world, though it has been under cultivation for only about one hundred years.

*Nutmeg* is the seed of a small tree originally growing wild in the Moluccas. It is now cultivated in the West Indies, Madagascar and other tropical regions.

*Cloves* are the dried flower buds of a beautiful evergreen tree of the myrtle variety, native to the Moluccas, but now naturalized in the West Indies and other tropical lands.

The *Banana* plant is found in most tropical countries, though it is believed to have originated in the East Indies. It is one of the most nutritious and valuable foods of the Torrid Zone. 'Humbolt estimated that one acre of bananas would yield as much nutritive material as 44 acres of potatoes, or 133 acres of wheat. The plant requires little if any cultivation.

The United States receives its bananas from Mexico, Central America and the West Indies.

The *Plantain* belongs to the same family as the banana but is a coarser variety. Its fruit is used mostly for cooking, while the banana is generally eaten raw. The plantain and banana furnish a large part of the food of the people of many hot countries.

The *Date*, the fruit of the date palm, has been for ages the chief food of the people of North Africa, Arabia and Persia, the home of this plant.

The stem of the tree runs up 30 to 60 feet, clear of leaves or branches, and is crowned with forty to eighty leaves, eight to ten feet long. The fruit grows among these leaves in bunches. The dates are eaten both fresh and dried. The dried dates are prepared for market by pounding and pressing them together in a solid mass. In this form they serve as the chief food of caravans in their journeys over the deserts.

The date palm is one of the most useful trees in the world. From it man not only gets food, but material from its wood and leaves for fuel, shelter, and many useful articles.

At the top of the stem is a soft pith, which, with the young, unfolded leaves about it, forms the "Palm Cabbage," highly prized as a food.

The *Cocoanut* is the fruit of the cocoanut palm, a tree common to the islands of the Indian Ocean, and the tropical regions of the Pacific. The fruit is an important article of food of the inhabitants of these regions, and the tree serves almost as many purposes as the date palm. It is taller than the date palm, sometimes growing to the height of 100 feet, but has fewer leaves in its crown. A tree in full bearing will ripen from 80 to 100 cocoanuts in a year. The nut will float in the water a long time without injury, and hence the cocoanut palm is one of the first trees to appear on a newly formed island.

*Sago* is a food obtained from the pith of several species of palm growing in the East Indies, China and Japan. The tree is cut down just before it flowers, when about 15 years old, and the inside, which is soft, is taken out and beaten in water, when the starch settles to the bottom. This when dried becomes the *Sago* of commerce. It is an important food of the natives.

The *Bread-fruit* is the product of the bread-fruit tree which grows on many of the islands of the tropics and furnishes food to millions of people. The bread-fruit is large, and when baked is said to resemble wheaten bread. The tree grows to the height of about forty feet and bears fruit eight or nine months of the year.

The *Fig* is the fruit of the fig tree, of which there are more than 100 species. The common fig trees are cultivated about every village in India and abound even to the Northern Himalayas. Its home was probably Persia. It has spread extensively, and now grows in every sub-tropical country.

It was one of man's earliest foods, probably before wheat and barley, and has been an important element in supporting human life. It is frequently mentioned in both the Old and New Testaments. In the Levant it is still an important article of food and the commercial supply of the world comes from that region, Egypt and Spain. England takes about 20,000,000 pounds of figs annually and the United States about 8,000,000 pounds. The best comes from Smyrna.

The *Grape* is of very ancient cultivation. It is believed to have originated in Asia and from thence spread over the temperate portions of both hemispheres.

It is cultivated extensively in the countries of central and southern Europe, principally for wine and raisins; also in California, Missouri, New York, Ohio and other states of the Union.

*Oranges* and *Lemons*, natives of Asia, are now cultivated in the subtropical regions of both hemispheres. They are grown extensively in the countries of southern Europe—especially in Italy and Spain—and in Florida and California. The trees live to a great age and are very productive. The best oranges come from Florida.

The *Pineapple* is a tropical fruit, native of South America. It is now cultivated in the warm regions of many parts of the earth.

*Apples*, *Pears*, *Peaches*, *Plums*, *Cherries*, *Strawberries* and *Raspberries* are the most common fruits of the Temperate Zone, and they surpass in amount and value all other fruits. These probably originated in the Eastern Hemisphere, though wild varieties of some of them are found in America.

The *Prune*, a kind of plum, is largely cultivated in southern Europe and in the Pacific coast states.

*Apricots*, fruit resembling the peach, are grown in southern Asia, countries bordering on the Mediterranean, and in California and Arizona.

The perishable nature of most of these fruits prevents their shipment in commerce except when dried, canned or preserved. The apple is the favorite fruit of the temperate zones, and is dried in large amounts by modern methods, and shipped to all parts of the world. All these fruits except the peach and apricot have a wide geographical distribution. The raspberry goes to 50 degrees north, the plum to 60 degrees north and the strawberry is abundant in Alaska and Kamchatka.

*Olives*, the fruit of the olive tree, thrive in all countries bordering on the Mediterranean, and in California. The fruit, and especially the olive oil derived from the fruit, are highly prized and form important articles of commerce.

## Food Products.

### ANIMAL.

*Cattle*, *Swine* and *Fish* supply the principal animal food used in the civilized countries. Of these, cattle are the most useful to man for their dairy products, services as draft animals, and for their flesh when fattened.

In the thickly populated regions, cattle are raised chiefly for dairy purposes; while in the thinly settled districts, they are raised for beef. Some of the great grazing districts of the world are in North and South America—the Pasture Lands of the Rocky Mountain regions, the Llanos of the Orinoco, and the Pampas of the La Plata.

Much of the beef of the United States comes from the Pasture Lands.

The cattle when ready for market are transported to the great meat-packing cities, where the beef is dressed for market, and the hides disposed of to make leather. The dressed beef is sent to various parts of the country in refrigerator cars, and is shipped abroad in iced chambers. Most of the export beef is composed of live cattle.

In 1890, the United States exported live cattle to the value of $31,000,000 and dressed beef to the value of $25,000,000.

Cattle, as well as horses, originated in Europe and Asia, where they have been used as domestic animals from the earliest times. From these regions they have spread to all parts of the world. The wild cattle and horses of South America are from the stock of the domestic breeds brought over by the early Spanish and Portugese settlers.

*Pork* is a more common food than beef, and is most used by the laboring classes, especially of Europe. Swine are easily and quickly raised, and furnish a greater amount of flesh in proportion to their size and the quantity of food consumed than any other domestic animals. They thrive well on corn, and are raised chiefly in states noted for this product.

Swine, like cattle, originated in Europe and Asia, where they were early domesticated.

In 1890, the United States exported pork to the value of $85,000,000, mostly to Great Britain and Germany. Live hogs are not exported for food.

Swine are dressed and prepared for the market in great pork-packing establishments, located at important points. Some of the great pork-packing cities of the Union are Chicago, St. Louis, Cincinnati and Kansas City.

*Fowls.* The various breeds of chicken, or barn-yard *fowls*, are believed to have originated in India. Their domestication began in every early times. The Duck and Goose came from wild species.

*Fish* are found in great abundance in both fresh and salt water. The most important food-fish are the cod, mackeral, salmon, herring and oyster (shell fish). Oysters, salmon, and the young herring, called *sardines*, are extensively canned.

Halibut and Haddock, salt-water fish, and the White Fish of the Great Lakes, are also important.

Some of the most noted fishing grounds of the world are the Banks of Newfoundland, located at some distance from the coast. Here the debris brought down by ice-bergs and the Arctic Current is deposited, making the waters shallow, and favoring the growth of various marine plants, on which the cod, halibut and other fish feed. More than 5,000 fishing vessels from the United States and other countries visit these grounds every year.

The next important fishing grounds are those of the North Sea and waters of Norway, famed for cod and herring.

Along the coast of Washington and Vancouver Island are valuable fishing grounds for cod and halibut.

*Mackeral* are caught along the Shores of New England and in other waters.

*Shad* and *Salmon*, though salt-water fish, are usually caught in fresh water, where they go to spawn. Shad fishing in the streams of the Atlantic coast, and salmon fishing in the streams of the Northern Pacific Coast, are industries of considerable importance.

The most extensive natural *shell-fish beds* in the world are in the Chesapeake Bay. Artificial beds have been planted on the coast of New England, Long Island, New Jersey and North Carolina, which have grown into great importance and rank next to those of Chesapeake Bay.

It is estimated that more than 150,000 men are employed in fishing in the United States; that the product of the fisheries amounts to over $50,000,000 annually.

Fish culture is carried on systematically by the United States and other nations. Important food fish have been transported to various parts of the world and propagated in new or exhausted waters. "Shad have been successfully introduced into the Rivers of the Pacific coast, and the Great Lakes have been restocked with white fish."

### 2. Clothing Products.

#### VEGETABLE.

*Cotton*, *Flax*, *Wool* and *Silk* are the great cloth-making fibers. The first two are of vegetable, and the last two of animal origin. All are produced in the temperate zones, though cotton is a tropical plant.

The *Cotton* plant is a native of most countries of the tropics. The cotton of commerce is of the old world variety, having been brought to the New World by the early settlers, and is mostly grown in subtropical regions.

The cotton plant bears many seed vessels, called "bolls." Each boll contains a number of seeds, each about the size of a pea. As the seed ripens the boll bursts open, and a soft, wooly substance growing from the seed puffs out. This is the cotton "wool," or *raw cotton* of commerce.

There are two principal varieties of cotton, the upland or "short staple," with fibers from an inch to an inch and a half in length, and the "long staple," or sea-island variety, with fibers two inches or more in length. The fibers of the latter variety are very fine and lustrous, and especially adapted for making the finest laces.

The crop of this variety is small but very valuable. It comes mostly from the South Atlantic States and from Egypt. Cotton clothes most people of the world, being supplemented by wool in colder seasons, and by furs in high northern climes.

The United States furnishes about two-thirds of the market supply of cotton, and India ranks next. China raises a large amount of cotton for home use and imports much besides.

In 1890, the United States exported cotton fiber to the value of over $250,000,000, mostly to England. In the manufacture of cotton, Great Britain ranks first. Then follow in order the United States, Germany and France.

There are about three pounds of seeds to one of fiber. The oil pressed out of the seeds is used for various purposes, such as making soap, substitute for lard, etc. The mass that remains after the oil is pressed out, is called *oil cake*, and is an excellent food for cattle. It is also a very useful fertilizer, as it contains most of the elements that the cotton plant takes from the soil.

Oil and oil-meal were exported to England and Germany to the value of $8,000,000 in 1890.

The seed of the cotton plant (short staple) is sown about the first of April of each year, and the ground is cultivated until the middle or last of June. The seed is generally sown in rows or drills and the plants are afterwards thinned out so as to stand about half a yard apart. The plant grows rapidly, and attains a height of four to six feet, branching out like a shrub, which it resembles in its woody fiber and general appearance. The bolls commence to mature, as indicated by their opening, about the middle of September, first along the lower branches and then higher up. The harvesting begins at the first opening of the bolls in September, and continues often until January, when the shrubs are themselves pulled up and burnt and the ground prepared for another crop. The cotton is picked into bags or baskets and carried to the cotton-gin, where the fiber is separated from the seeds. It is then packed into large bundles, called bales, containing about 400 to 500 pounds each. These bales are shipped to the manufacturing centers, where the fiber is made into cloth.

The cotton-gin has been the means of increasing the production of cotton and cheapening it to a wonderful extent. Originally only a small quantity was raised because much time and labor were required to separate even a small amount of fiber from the seeds—one pound of clean fiber being a day's work for a man. After the cotton-gin was invented a man could clean a thousand pounds in a day. This machine has since been improved and its capacity greatly increased.

The *Flax Plant* was cultivated in the earliest times, and probably originated in western Asia. Mummy-cloth, found in ancient tombs, was made of flax-fiber.

This plant thrives in most countries of the Temperate Zone. It grows to a height of from two to four feet, and has a small blue flower. The small seed vessels contain the flax seed, or *lin-seed*, from which is extracted the *lin-seed oil* of commerce, used largely in mixing paints and varnishes. The *lin-seed cake*, or part left after the oil has been extracted, is a very nutritious food for cattle.

To obtain the fiber, or lint, the flax is pulled up by the hand or cut close to the ground by machines, the same as are used for cutting wheat or oats. It is then placed in shallow ponds or pools of soft water or spread upon the grass for retting (rotting.) When the rotting has continued long enough so that the fibrous covering is easily separated from the woody stem, the flax is thoroughly dried, and then put through a machine which breaks it so fine that the "shives," or broken bits of stalk, may be removed by "scutching" or swingeing," an operation performed by simple hand appliances or by complicated machinery. After the scutching comes "heckeling" or combing, which subdivides the fibers into their finest filaments, removes the short fibers (tow), and leaves the long glossy fibers, the real lint, untangled and ready for spinning. This is the *raw material* from which the linen cloth is manufactured.

Russia produces more flax than any other country. It is also largely raised by Germany, France, Austria, Belgium, Ireland and Italy. Considerable quantities of flax are now raised in the United States and Canada, mostly for the oil and seed.

In the manufacture of linen, Russia leads the world. Italy, France, Ireland, Scotland and Germany are also noted for the manufacture of this article.

In 1890, the United States imported over $16,000,000 of linen goods from Germany, and over $5,000,000 worth of raw flax and linseed oil from other countries.

Flax is an important crop in several states, especially in Minnesota and Iowa.

## Clothing Products.

### ANIMAL.

*Wool*, next to cotton, is the most important clothing product. It is the soft, crispy hair which grows on the llama, alpaca, camel, goat and sheep. Most of the wool of commerce comes from the sheep.

In the wild species the wool is long and hairlike. The fine, closely matted fleece has been developed by domestication and careful breeding. One valuable quality of the fibers of wool is that their sides are serrated or toothed, thus enabling them to unite with each other to make a strong fabric.

The sheep originated in Europe and Asia, where it has been domesticated from the earliest times. The merino sheep was introduced into Spain by the Romans.

The great wool producing countries, in order of amount of product, are Australia, New Zealand, Russia, United States and Argentine Republic; in order of manufacture are Great Britain, France, United States, Germany and Austria.

The very fine white wool of the Angora goat of Asia Minor, sometimes called "mohair," is made into Persian shawls and other fine fabrics. The Cashmere goat furnishes a fine grade of wool, from which the costly Indian shawls are made.

The alpaca and the llama have a long and glossy wool, suited for making a fine quality of dress goods, which is obtained mostly from Peru.

The United States imported wool and woolen goods to the value of over $70,000,000 in 1890.

*Silk* is a fine glossy thread made by the silk worm in spinning its cocoon.

The worm is hatched from the egg of a moth called the *bombix mori*, and feeds upon the leaves of the mulberry tree. When about a month old it spins a cocoon about itself.

If left undisturbed after spinning its cocoon the worm would first change into a pupa, or chrysalis, and finally into a moth, when it would eat through the cocoon and spoil it. To prevent this, the cocoon when made, is put into hot water or baked, to kill the worm. The next process is to twist the fibers of several cocoons together into a single thread. The threads are then made into skeins, cleaned, and packed into bales of about 100 pounds each. This is the *raw silk* of commerce.

Silk culture was first known in China. From there it has been introduced into other countries. Most of the raw silk comes from China, Japan and Italy. In silk manufacture France ranks first; Germany, second; and the United States, third.

The mulberry tree, from which the silk worm gets its food, thrives best in subtropical climates. These countries are, therefore, the home of the silk worm.

The cultivation of silk in China is from the remotest antiquity—began, according to Chinese records, 2600 B. C. It was introduced into Europe 530 A. D.

In 1890, the United States imported raw silk to the value of $23,000,000, and silk goods to the value of nearly $40,000,000.

*Leather*, made from the skins of various animals, is the raw material for the manufacture of boots and shoes, gloves, harnesses, etc. Leather is made from hides by tanning. That is, by treating them with tannic acid found in the bark of the hemlock, oak and some other trees.

*Furs* are worn in winter by the people of Europe and America for warmth and adornment. Among the most prized furs are those of the sea otter, sable, ermine, silver gray fox, and fur seal; all of which are found in America. Siberia is a great source of supply for valuable furs. The fur seal is found in Alaskan waters. In order to preserve the seals from extermination, the government allows only a certain number to be taken each year. The skins of the seals require special treatment to fix them for the market. The long coarse hairs are plucked out and the furs dyed.

The world's chief fur markets are London, Leipsic and Nijni Novgorod.

The seal visit the Pribilof Islands in May and June of each year to the number of several millions. They leave there in October and November for milder waters during the winter,—some going to Japanese waters, and others to the coast of Washington and British Columbia.

## Mineral Products.

*Iron* is the most useful as well as the most common of all metals. It is very strong, and when heated can be hammered into almost any shape, drawn into wire, or welded. It is fashioned into a variety of useful things, small and large, such as cutlery, machinery of all kinds, bridges, railways, ships and buildings.

Iron is never found in the pure state, but mixed with other minerals, and is then called *Iron Ore*. It is easily rusted, or oxidized, and is generally found in this form. It also occurs mixed with sulphur, carbon, and phosphorus. To separate the iron from the ore, fuel and ore are put into a *blast furnace* with some limestone. In the great heat the iron melts and collects at the bottom of the furnace, while the impure parts, called "slag," being lighter, rise to the top. This process is called *smelting*. The most common fuel used for smelting iron ore is coal, or coke; charcoal, petroleum and natural gas are also used. The limestone, usually called the "flux," is put in to take out the earthy impurities, with which it unites. The finest iron is produced by smelting the ore with charcoal.

When the iron is melted it is usually drawn from the furnace and cast into bars of about one hundred pounds each, called "pigs," the *pig iron* of commerce.

Iron expands slightly when cooling, and this property makes it especially valuable for *casting*, as it will fill the molds evenly and smoothly.

By a refining process, called "puddling," pig iron is freed from certain impurities, such as carbon and phosphorus, and becomes tougher and more malleable. It is then called "malleable," or wrought iron.

When iron is refined so as to contain a very small amount of carbon, it is called *Steel*. The process most commonly used for making steel is the "Bessemer." Steel is lighter and more flexible than cast iron or wrought iron and can be tempered by heat to almost any degree of hardness, or elasticity.

As the smelting and manufacture of iron requires much fuel the ore is usually carried to the coal fields, or near them, for working up.

The United States leads all nations in the manufacture of *Steel*. Most of the rails of railroads, ships, engines, machinery, cutlery, etc., are made of steel. The principal iron ore mines of the United States are located on the northern lake shore of Michigan, Wisconsin and Minnesota; along the Appalachian ranges of mountains; and in Missouri. Iron is found in greater or less abundance in many of the states, and in most countries of the world.

Sweden is noted for its fine quality of iron, and Germany for its heavy iron ware. England manufactures more iron than any other country.

*Copper*, next to iron, is the most úseful metal, and is found in all parts of the world. It is very malleable and ductile, and one of the best conductors of electricity known.

Copper readily combines with other metals to form alloys, and is much used in this way. Combined with zinc it forms *brass;* and with tin, it forms *bronze* and *bell-metal.* It is also alloyed with gold and silver in making money.

Copper is found both in the pure state and as an ore. The richest mines in the world are in Montana and Northern Michigan. Chile ranks next to the United States in the output of copper. Next in order come Spain, Germany and Australia.

The United States exported about $8,000,000 worth of copper in 1890.

*Tin* is a flexible and malleable metal, and not very ductile. It does not tarnish or rust easily, and is much used in coating sheets of iron for manufacture of "*tin ware*," etc. Alloyed with lead, tin forms *solder*, *pewter*, and *type-metal;* alloyed with copper, antimony and bismuth, it forms "*britannia ware*."

Cornwall, England, formerly furnished most of the tin used in the world. Now most of the tin comes from the mines of Banca and Billiton, islands of the Dutch East Indies. These are the richest tin mines known. The Banca tin is the purest found anywhere. Tin is also found in Bolivia, Peru, Australia, and in the Black Hills of South Dakota.

The United States imported from England and the East Indies about $7,000,000 worth of tin in 1890. The manufacture of tin in the United States is rapidly increasing.

*Lead* is a heavy metal, but very malleable and soft, being easily cut with a knife. In nature it is usually found in combination with sulphur, forming the ore called *galena*. It is also mixed with silver ores. Lead is found in many parts of the world. The most important lead mines of the United States are in the section where Iowa, Wisconsin and Illinois meet.

Lead is used in making pipe, tubes and shot. Heated in the air, lead oxidizes and becomes an orange colored powder, called *litharge*, much used in the manufacture of paint, cement and flint glass. White lead, used in mixing paints, is also made from this metal.

The United States produces more lead than any other country. Spain ranks next.

*Zinc* is a much tougher and harder metal than lead. It is usually found in combination with lead and sulphur. It does not easily rust, and for this reason is much used as lining for water tanks and bath tubs. Sheet iron is sometimes coated with it, producing "galvanized iron." Zinc is also used in electric batteries.

This metal is found most abundantly in Germany. Belgium ranks next, and the United States third. The most valuable mines in the United States are in Missouri and New Jersey.

*Gold* and *Silver* are called the *precious metals.* They are used in making jewelry and plated ware, but principally as money. For the latter purpose they are slightly alloyed to make them more durable.

These metals are comparatively rare, do not tarnish, and are especially adapted for coinage purposes.

The United States Government has located *mints* for coining these metals into money at Philadelphia, Denver, San Francisco, and other cities.

*Gold* is found in many parts of the world, but most abundantly in the Rocky Mountain region and Pacific States, in Alaska, in Eastern Australia, and in the Ural Mountains. The United States furnishes the largest amount of gold and Australia the next largest.

Gold generally occurs in the pure state as viens in quartz rocks, and in soils which have been made by the washing away of these rocks. In order to separate the metal from the quartz the rock is crushed to powder by powerful machinery and then agitated with water and quicksilver. The quicksilver combines with the particles of gold, forming an *amalgam*, from which it is afterward separated by distillation. The quicksilver may thus be used over and over again.

When gold occurs in the soil it is generally obtained by *hydraulic mining.* Water is brought in ditches, often many miles, to an elevation above the deposits and carried down from them in iron pipes and directed in streams of great force against the bank to be excavated. The soil is washed away and carried through long sluice-boxes, in which the gold, being heavier than the other material, falls to the bottom and is caught, while the rest passes off.

*Silver* is seldom found in the pure state, but generally in combination with other substances, especially lead.

The United States leads all other countries of the world in the production of silver—Colorado, Montana and Nevada being the most important silver states, and then follow in order, Mexico, Peru and Bolivia.

*Quicksilver*, or *Mercury*, is usually found combined with sulphur in the ore called *cinnabar*. It is used largely in the production of gold, and in the manufacture of mirrors, thermometers and barometers.

Quicksilver is found in Almaden, Spain; in Australia; but most abundantly in New Almaden, California.

*Platinum* is one of the most ductile of metals and the most infusible. It cannot be melted by any ordinary heat. It is heavier than gold and is quite rare—found chiefly in the Ural Mountains. It is used principally for making crucibles and other articles which are subject to great heat.

*Nickel* is a grayish-white glistening metal, capable of receiving a high polish, quite hard and not easily tarnished or oxidized. On account of these qualities it is largely used in plating various articles made of iron and brass. It is used as an alloy with copper in many small coins. German silver is an alloy of nickel with brass. Nickel mixed with steel greatly toughens and hardens it and is used now in making steel armor plate. Nickel is found in Germany, Sweden, New Caledonia, and United States.

*Coal* is the product of a wonderful vegetable growth in ages past, which fell down and accumulated in great masses, was covered by water and so kept from utter decay. In some places floods carried down similar material, piling it up in huge masses. The surface sank and rose many times, and each time the process was repeated, forming successive beds with strata of some material between them. It was thus that the weight of strata above the vegetable matter pressed it into solid form and with heat changed it into coal.

The coal which was most recently formed and lies nearly level is called the *bituminous*. This is the ordinary condition of coal. In the furnace it slacks or breaks up and burns with a flame and black smoke. When the mountains were formed by the wrinkling and upheaval of the earth's crust, the coal beds in them were exposed to greater heat and chemical change, which drove out the elements which caused most of the smoke and flame, and left hard or *anthracite* coal.

Some coal was formed in all subsequent eras, and is slowly forming now in the peat bogs of Ireland; the Dismal Swamp region of Virginia and North Carolina; near the mouths of the Mississippi, and elsewhere. The process of change to coal is slow, and we come from the oldest and best anthracite through the bituminous up to the later brown coal called *lignite;* then to peat, the last.

In the very old folded and twisted rocks in Rhode Island and New York, the coal has been so greatly changed as to become *graphite*, known also as *plumbago* and *black lead*, from which pencils are made.

Other products closely associated with coal in origin are naphtha, petroleum, natural gas, mineral tar and asphaltum. Out of certain kinds of coal, illuminating gas and coal tar are made; and out of coal tar, aniline dyes, even some medicines and other things.

Coal, now the principal fuel of civilized man, was scarcely known, even to our fathers. Wood and charcoal were the fuel used before men had learned that "stone coal," as it was called, could be burned, and vast forests were consumed in the furnaces, even of our own country.

*Petroleum* (rock oil) is found in many parts of the world. Sometimes it rises to the surface of the ground but it is generally obtained by sinking wells, often more than a thousand feet deep. In some of these wells the oil rises and flows over the top, being forced out by a gas which is usually found with it; but in most cases the oil has to be pumped out. It is not known just how petroleum is formed in the earth, but it is now generally believed that the oil has been made chiefly by the decay of sea plants and animals under great pressure.

The crude petroleum, as it slowly oozes from the earth, absorbs oxygen from the air, and in this way is changed into "mineral tar." If this operation is long continued, the substance takes the more solid form of *asphalt*. Asphalt is used largely for paving purposes, and is found in California, Venezuela, Peru, and other parts of the world, but most abundantly on the island of Trinidad.

Petroleum was known to exist in Europe and Asia centuries ago, and was used in Greece and Italy to burn in lamps, and as a medicine. Its great value as a luminant, however, was not dreamed of until about forty years ago, when the Pennsylvania oil wells were developed.

There are two qualities of American petroleum. The poorer quality, found in California and Ohio, is used as fuel; while the purer quality, found in a narrow strip of country extending two hundred miles along the western slope of the Allegheny Mountains, is used for illuminating purposes. Most of the crude petroleum is transported in tank cars or pipe lines to Cleveland, Pittsburg, Buffalo, Brooklyn, Philadelphia, Baltimore and Chicago, where it is refined for use.

As the petroleum comes from the earth it is a thick, oily liquid of a yellowish, brownish or greenish color, and unpleasant odor.

In its crude state petroleum is used for fuel. For other purposes it is *refined*, or *distilled*. The first and largest product of this distillation is *gasoline;* the next, *naptha;* the third, *benzine;* and the fourth, *kerosene* or "*coal oil*". *Kerosene* is the great luminating fluid, and is exported in large quantities to other countries. The next product after kerosene is *paraffine oil*. This also yields several burning and lubricating oils, as well as "*paraffine wax*," and *vaseline*.

The principal places where petroleum is found are the north part of Italy; on the shores of the Caspian Sea, near Baku; at Rangoon, Burmah; in the Caucasus Mountains; in Galicia, Austria; and in the United States and Canada. In the

United States the chief places are in western Pennsylvania, West Virginia, Ohio, Kentucky and Tennessee; but some is also found in other states.

The richest petroleum fields in the world are found along the western shore of the Caspian Sea, but they are not as thoroughly worked as those of the United States. Petroleum is used as a fuel by steamships on the Caspian Sea, and by many locomotives in Russia.

The exports of petroleum products from the United States in 1890 amounted to over $50,000,000.

*Natural Gas* is found in and near the great oil fields, and is obtained by sinking pipes into the ground. It is chiefly used for heating purposes, making a cheap fuel for homes and factories.

*Glass* is made from powdered quartz, (flint or sand), lime, potash, salts of soda, lead and bleaching material, all melted together at a high temperture. The "glass metal" thus produced, is made to assume various shapes by *blowing*, *casting*, *or pressing into molds.*

Glass manufacture is carried on in many European countries, and in Massachusetts, New York, Pennsylvania, West Virginia and other states. The best plate glass comes from England, France and Belgium. Bohemia is noted for its fine cut glass. Bottles, vials, etc., are made largely in Germany, England and France.

Clay is one of the most common of mineral substances. The very important metal *aluminum*, is obtained from it. Brick and terra-cotta are made from common clay. From the finer quality of clay are made *stone ware*, *earthen ware and crockery*. From the finest clay, called *Kaolin*, or *China clay*, is made the *Chinaware or porcelain*. In the manufacture of clays they are first worked, or kneaded, then put in molds aud baked. The common kinds of glazed ware are called *stone ware and earthen ware.* Chinaware was so named because it was first made in China. The best chinaware is now made in Germany, France and England, where kaolin is abundant. A large amount of crockery is made in New York, Pennsylvania, New Jersey, Illinois and Ohio.

Clay, suitable for making brick, is found in abundance almost everywhere. The red color of brick is due to the iron which is common to most clays. Some brick clay has so little iron in it that the color becomes a sort of cream when the clay is burnt, like the Milwaukee brick.

*Building Stone* of various kinds is found in most sections of the United States and of the world.

Some of the most important kinds are limestone, granite, sandstone and slate.

Marble, a dense form of limestone, is the most valuable of all building stones. Most of the marble quarried in the United States comes from Vermont. Tennessee, New York and Georgia also furnish large quantities. The finest comes from Italy.

Common limestone is quarried in many parts of the United States, but most abundantly in Pennsylvania and Illinois. Much of it is burned to make lime for plaster.

Granite is a very hard and durable stone quarried largely in New England.

Sandstone comes mostly from Ohio, Pennsylvania and Colorado, though a fine quality of it is found in New England. A fine grade of sandstone suitable for making grindstones comes from Ohio and Nova Scotia.

Most of the slate used in this country for roofing, flagging and black boards, comes from Pennsylvania and Vermont.

*Salt*, a most important article of food, is obtained from salt wells and sea water by evaporation, in most countries. Rock salt is dug out of salt mines in Austria, Spain and the United States. The salt mines of Austria are the most extensive in the world.

*Sulphur* exists in various combinations, but the sulphur of commerce is found in almost a pure state near volcanoes.

It is most important in the manufacture of sulphuric acid, or "oil of vitriol," gun powder, matches, for vulcanizing rubber, and for bleaching. Most of the sulphur of commerce comes from Sicily.

*Precious Stones* are rare mineral substances possessing such beauty of color, brilliancy and durability, as to especially fit them for use in jewelry, or for ornamental purposes. The *diamond*, *ruby* and *emerald* are the most valuable.

The *diamond* is the hardest, most brilliant, and, next to the ruby, the most valuable of precious stones. Diamonds are found principally in Kimberly, South Africa,—the richest mines in the world,—and in Brazil. The *true oriental ruby* often brings a price from five to ten times that of the diamond. Rubies are found in Burmah, Ceylon and India. The *emerald*, a stone of a rich green color, and next to the diamond in value, is found in Columbia, Siberia and India.

Some of the other precious stones are the *amethyst*, *topaz*, *opal* and *turquoise*. The value of precious stones is greatly enhanced by the cutting. Most of them are sent to Amsterdam, Antwerp and London to be cut and set.

The United States imported precious stones and imitation "precious stones," to the value of $12,000,000 in 1890.

### Miscellaneous Products.

*Trees* furnish shade, give variety and beauty to the landscape, and exert an important influence on climate, especially on rainfall. They supply the fuel most widely used, as well as gums, resins, tanning bark, dyewoods, drugs and fruits. Their timber is used in the building of all kinds of structures and in the manufacture of furniture and a great variety of useful articles.

*Pines* is the name given to numerous kinds of conebearing evergreens which flourish mainly in the Northern Hemisphere. The most important of these are the *white pine*, the *Oregon pine*, the *Norway pine*, and the *California red wood*, as well as *cedars*, *spruces*, *hemlocks* and *firs*. The lumber from these trees is most extensively used in building, and in manufacturing.

*Hardwoods*, such as the *oak*, *walnut*, *chestnut*, *maple* and *cherry* are found in the temperate zone. *Oak* furnishes the strongest lumber, and is largely employed in the manufacture of furniture and wagons, and in ship building. The oak and hemlock furnish bark for tanning. Cork is obtained from the bark of the cork-oak tree, which grows abundantly in Spain and other countries bordering on the Mediterranean Sea. The *black walnut* is much used for cabinet work and gun stocks. The wood is of a dark brown color, and admits of a high polish. *Chestnut* is much valued for railroad ties. From the dense hardwood of the *apple tree* are made stock for planes, shoemakers' lasts and small articles of furniture. *Boxwood*, found in India, is a very hard, close-grained wood, and principally used in making wood engravers' blocks and fine rules. *Mahogany* and *rosewood*, of Central and South America, are among the most highly prized woods for fine cabinet work.

*Ebony*, a hard, durable wood, used in ornamental furniture, mostly as veneer, grows in Ceylon, Madagascar and Central America. *Teak*, a strong, tough wood, found in farther India, is employed in ship building.

*Lignum Vitae* is a heavy, hard, close-grained and tough wood growing in Central America and the West Indies. It is used for making rules, pulleys, pestles, balls for bowling alleys, etc.

The *Bamboo*, "one of nature's most valuable gifts to uncivilized man," is a tree-like grass, reaching a height of 50 to 70 feet and from 5 to 15 inches in diameter. Its stem is divided into joints, and attains its full height in a few months, sometimes growing over two feet in a day. Its seeds and tender shoots are used for food, and its stem for constructing bridges, houses, and for making a variety of utensils such as cloth, paper, ropes, baskets, drinking cups and bottles. In China, Japan and the East Indies, whole houses and their furniture have been made out of it. The bamboo grows in the tropical and subtropical regions of both hemispheres.

*Hemp* and *Jute* are vegetable fibers used mainly in making cordage and coarse textile fabrics, such as sacking, etc.

*Hemp* is made from the fiber of the hemp plant, which grows extensively in China, Japan, Southern Asia, Egypt and to a less extent in the United States and most countries of Europe. *Manila* hemp, the fiber of the wild banana, is exported in large quantities from the Philippine Islands.

*Jute*, a plant with a longer fiber than that of the hemp, is largely cultivated in the delta of the Ganges. The principal manufactures of jute are carried on in Scotland; at Glasgow, Aberdeen and Dundee.

The *Tobacco* plant is a native of America, but has been acclimated in other countries. It was smoked by the natives of the West Indies when Columbus first landed there. The best tobacco is raised in Cuba and Turkey. The United States raises about one-fourth of the world's supply. Tobacco was the first profitable article of commerce from the Virginia colony.

*Cinchona*, or "Peruvian bark," is the bark of a tree native to South America, from which is obtained *quinine*—a valuable medicine in the treatment of fevers. This tree has been introduced into Java, Southern India, Ceylon and British Burmah with success; so part of the supply now comes from those countries. The Cinchona trees vary from 40 to 100 feet in height, and those raised in plantations yield better than those growing wild.

*Opium* is the dried juice of the opium poppy, raised chiefly in India, China, Persia and Turkey. It is of great value as a medicine.

When the poppy heads are nearly grown and begin to ripen, shallow incisions are made in the evening through the skin, from which a milky juice flows and is gathered in the morning. This is drained of its watery parts, and slowly dried into a brown, sticky gum. This is then worked into a mass, dried and packed in tin lined cans. It is then *opium gum*, one of the most important medicines in the world. A proverb says: "A physician without opium is like a soldier without a weapon."

It reaches every country in the world, but the Chinese use more than any other people, either eating it or smoking it when mixed with hasheesh and spices. As China produces four-fifths of its supply and imports fourteen million pounds a year from India and large quanties from Persia and Asia Minor, it consumes near 75,000,000 pounds annually at a cost of $280,000,000.

Celebrated as India has ever been for its riches, opium has the highest value among its exports. The United States is supplied mainly from Asia Minor.

*India Rubber* is so called because it was first obtained from India and on account of its first known use,—to rub out pencil marks. *Caoutchouc* is the native South American name. It is the coagulated juice of trees growing in Central America, and the tropical regions of South America, Africa, India and adjacent islands. There are several different species of rubber producing plants. From India rubber are manufactured a variety of useful articles, such as water-proof cloth, foot wear, water bags, air cushions, tubing and medical and surgical articles. When mixed with sulphur and heated under pressure "Vulcanized" rubber, "Vulcanite,"or "Ebonite" is produced. This form of rubber is very hard, durable and elastic, and will take a high polish. Combs, buttons, etc., are made from it.

The juice of the rubber tree is obtained by making incisions in the bark of the tree and catching the sap as it runs out. This sap, which at first has a milky appearance, is slowly heated and smoked until it coagulates into a dark mass, the *raw rubber* of trade. The rubber tree is now cultivated in large groves of 30,000 trees or more. The best rubber is the Pari rubber of South America and that from Mozambique. The United States imports $15,000,000 worth each year from Brazil.

*Gutta Percha* is the hardened juice of trees which grow in the East Indies. It is somewhat similar to vulcanized rubber in appearance and uses. Both are employed in making electrical insulators.

*Sponges.*—The sponge of commerce is the skeleton of the sponge animal, which grows at some depth in the sea, fixed to rock or ground. Sponges are found on the southern coast of Florida and Bahama Islands, but most abundantly in the Mediterranean and Red Seas. The finest are from the Aegean Sea. The best sponges grow in clear, quiet water from 150 to 200 feet deep. Most sponges are obtained by means of long spears; but where the depth is over 40 feet divers are employed or dredges used.

*Liquors* comprise *spirits, wines* and *malt liquors. Spirits* are distilled from wine, grain, corn and sugar.

*Wine*, fermented grape juice, is the chief product of most grape raising countries, such as France, Italy and Germany.

*Malt liquors*, comprising beer, ale, porter, etc., are made from barley and hops. They are manufactured in all countries where barley and hops are raised.

*Paper* for *writing* and *printing* is made from linen and cotton rags, and from wood pulp (of the poplar, cottonwood and spruce.) The finest paper is made from linen rags. *Wrapping paper* is made from straw, jute and hemp.

The United States leads all other nations in the production of paper. Great Britain ranks second, and Germany third.

The principal countries producing:—

*Rice.*—China, Japan, India, East Indies, United States.

*Wheat.*—United States, Russia, Argentine Republic, India, Austro-Hungary, France, Italy.

*Corn.*—United States, Canada, Mexico.

*Tea.*—China, Japan, India.

*Coffee.*—Brazil, Java, Arabia, Central America, West Indies.

*Spices.*—East Indies, West Indies.

*Cotton.*—United States, India, Egypt.

*Wool.*—Australia, New Zealand, Russia, United States, Argentine Republic.

*Silk.*—China, Japan, Italy, France, Spain.

*Coal.*—Great Britain, United States, Germany, France, Belgium, Australia.

*Petroleum.*—United States, Russia.

*Iron.*—Great Britain, United States, Belgium, Russia, Sweden.

*Copper.*—United States, Chile, Spain, Germany, Australia.

*Gold.*—United States, Australia, Russia.

*Silver.*—United States, Mexico, Peru, Bolivia, Austria.