WHY AND BECAUSE;

OR,

THE CURIOUS CHILD ANSWERED:

TEACHING CHILDREN OF EARLY AGES TO THINK AND INVESTIGATE.

WITH TWO CLOCK FACES.

BY THE REV. DAVID BLAIR,

Author of the "First Catechism," the "Universal Preceptor," the "Tutor's Key," "Registers for Schools," "Grammar of Natural Philosophy," &c., &c.

London:

PRINTED FOR THE AUTHOR:

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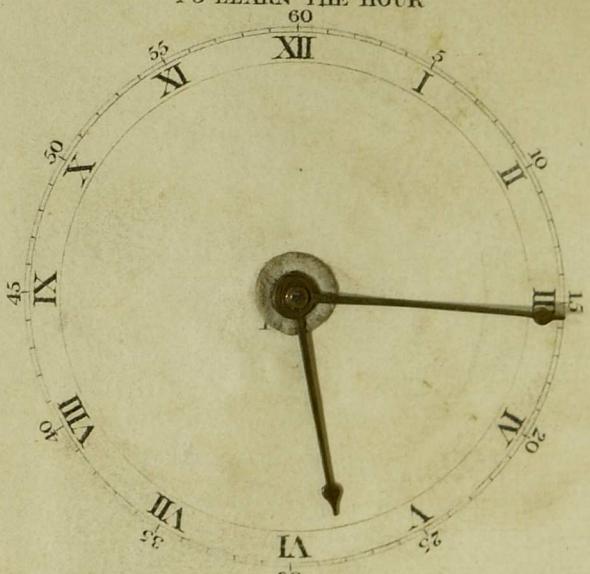

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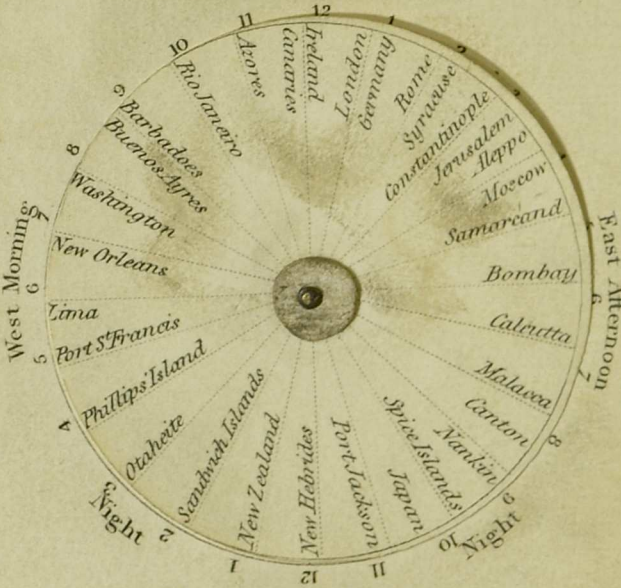

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THE TWENTY-FIFTH EDITION.

London:

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The Author of this work considers it due to himself and the Public, to guard Parents and Tutors against imitations, and surreptitious editions of his works, by which the purposes of Tuition, and the original plans of the Author, are often frustrated.

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All his works are original, and, as may be expected, all imitations and copies of them are inferior.

PREFACE

TO THE TWENTY-FIFTH EDITION.

After the sale of so many editions of this little work, nothing need be said in its commendation. Perhaps it has effected as much for the rising generation, as any of the most successful works of the Author, and as any work which has appeared for the last ten years.

To this edition, he has affixed an improvement, which needs no observation, as it cannot fail to gratify both children and parents. Of course, he refers to the clock faces; and it is merely necessary to add in this place some examples and exercises which children may perform while committing the book to memory.

THE CLOCK AND WATCH FACE.

What o'clock is it when both hands stand at XII (12)?

What o'clock is it when the longest, or minute hand stands at VI, and the hour hand midway between XII and I?

What o'clock is it when the hour hand stands near III, and the minute hand at 45?

What o'clock is it when the hour hand stands just beyond VIII (8), and the minute hand at 10?

Set the two hands at XII o'clock.

Set the two hands at a quarter after XII.

Set the two hands at half past VI (6).

Set the two hands at a quarter to X (10).

Set the two hands at a quarter after X.

Set the two hands at a quarter to XII.

Set the two hands at 10 minutes to IX (9).

Set the two hands at the time of beginning School in the morning, and the time of leaving School in the afternoon.

Set the two hands for the breakfast, dinner, and supper time.

The Tutor may add to these, *till* the child is quite perfect

THE GEOGRAPHICAL CLOCK.

As the Sun is the cause of Day and Night, and we call it 12 o'clock or Noon at every place on the earth when turned directly towards the Sun; and Midnight or 12 at night when turned directly from the Sun; so, there are all the intermediate hours between Noon and Midnight, and Midnight and Noon, at different places on the earth at one and the same moment.

The Earth turns completely round every 24 hours, at the rate of 1036 miles an hour; this Clock, therefore, shows what o'clock it is at any place when the hour is known at any other place, by setting that place at the given hour in the circle.

Thus, if we reside in London, and the given hour is 12 at Noon, it is 3 in the afternoon at Moscow, 6 at Calcutta, ½ past 7 at Canton, nearly 12 at night in New Zealand, 5 in the morning at Phillips's Island, ¼ past 8 at Barbadoes, and 10 in the morning at the Azores. The Sun is fixed at 12, and the Earth is turning from West to East, or left to right, so that, when London comes to 1, it will be 12 at the Canaries.

Again, if we suppose it to be 6 in the afternoon at London, then, on setting London at 6, it will be noon at New Orleans, 12 at night at Calcutta, 6 in the morning at New Zealand 11 in the morning at Lima, &c., &c.

But, if we reside at Otaheite, and it is 3 in the afternoon at that Island, then on setting Otaheite at 3 in the afternoon, it will be noon at the New Hebrides, ½ past 12 at night at London, ½ past 5 at Bombay, 4 in the afternoon at Phillips's Island, &c., &c.

Let the Pupil then write the hours when it is 10 in the morning at London, severally at Jerusalem, Washington, Canton, and Lima.

Let him write the hours when it is 6 in the afternoon at Port Jackson, London, the Spice Islands, Moscow, and Lima.

Let the Pupil write the hours when it is 9 in the morning at Phillips's Island, at Bombay, London, Calcutta, Washington, and Jerusalem.

Let the Pupil tell where it is noon when it is 10 at night at London; where it is midnight, where 6 in the morning, and where 6 in the afternoon.

N.B. Tables of Longitude effect the same thing: for the 24 hours are 360 degrees; hence, every hour is 15 degrees, and every degree is 4 minutes in time.

The Author begs to suggest to all anxious Tutors, that as a book of general reference for the use of schools, none can be compared for variety and accuracy with Sir Richard Phillips's Million of Facts. It ought, at least, to be in possession of every youth on leaving school, or as soon as he arrives at years of discretion. The Author's Catechisms, this "Why and Because," his Familiar Vocabulary of Technical Words, his Universal Preceptor, and the Million of Facts, constitute, in fact, such a course of Liberal Education and Practical Knowledge as never before were submitted to the world; and if the next is not a wise and improvd generation, it will not be for want of literary tools.

In this place the Author considers it not improper, for his own credit and the advantage of the public, to subjoin a brief list of successive productions during the last thirty years: most of them have reached the twentieth, and some of them the hundredth edition.

1. Three Catechisms.
2. This Why and Because.
3. An English Grammar.
4. The Universal Preceptor.
5. The Grammar of Natural Philosophy.
6. The Class Book.
7. Easy Lessons in Reading.
8. Registers for Boys' and Girls' Schools.
9. The Tutor's Key.
10. Separate Keys to twenty-eight several works.
11. The Vocabulary of Technical Words.
12. First Lines of Arithmetic.

And he meditates a 13th and last, under the title of *Knowledge for the People, or the New Young Man's Companion.* He flatters himself that he shall then have run his race, and have deserved well of his country

His last task was the contriving and executing the two Clock Faces to this little work, in which he conceives he has rendered an acceptable service to his rising friends of the next generation.

WHY AND BECAUSE,

OR

THE SOCRATIC METHOD

APPLIED TO ALL SUBJECTS

OF

YOUTHFUL ENQUIRY AND CURIOSITY.

Why do seven days make a week?

Because a week is the nearest number of days to the quarter of a moon, the moon's period from full to full being 29½ days nearly.

Why are names given to the days?

Because they are convenient in reckoning and recording time. We repeat the same names every 7 days; but in Eastern countries they have a fresh name for every day throughout the whole moon.

Why are there 4 weeks in a *month?*

Because 4 weeks or 28 days are nearly a *moon* of 29½ days, that is from one full moon to another.

Why are 12 months a year?

Because the earth in its orbit round the sun returns in a year to a similar position; and the days, nights, and seasons are then exactly the same as before.

Why are some months longer than others?

Because there are 365 days and about 6 hours

in a year, and the 12 unequal months just make up 365 days.

Why do we make some years leap-year, or 366 days making 29 days, in February ?

Because, as we lose about 6 hours every year, so in every 4 years we make the year a day longer to keep our reckoning of time and the earth's motions in agreement.

Why are the days called by their present names ?

Because the Saxons, our ancestors, worshipped certain deities—as the Sun, the Moon, Tuesco, Woden, Thor, Frya, and Saturn; which last, or Saturday, is the Jewish Sabbath or seventh day.

Why do we keep the Sabbath on Sundays ?

Because Christ rose on a Sunday, and Christians met for worship on that first day of the week.

Why is it Day ?

Because the sun, the source of light and heat, is visible, or, if obscured by clouds, is above the horizon.

Why is it Night ?

Because the sun has set, or is below the horizon.

Why does the sun rise and set ?

Because the earth on which we live is round, and it turns round or spins on its axis like a top, so that we the inhabitants are carried to and from the fixed sun in every 24 hours.

Why are the day and night divided into twice 12 hours ?

Because the earth turns round in 24 hours, and taking the longest and shortest days, and the longest and shortest nights, they are in a year each equal to 12 hours on the average.

Why is an hour divided into minutes and seconds ?

Because it is convenient in reckoning; a day there-

fore is divided into 24 equal hours, every hour into 60 minutes, and every minute into 60 seconds.

Why is Time never present—now come, now gone?

Because it is a mere effect of the great motions of nature, as of the diurnal and annual motions o the earth, of the moon, planets, &c.

Why is it eternal?

Because succession by motion is everlasting, and while there are phenomena there must be time.

Why do the stars rise and set?

Because the stars are fixed, and the earth is turning round on its axis every 24 hours.

Why are the stars different at the same hour in different periods of the year?

Because the earth performs an orbit round the sun in every year, and, the more distant stars being fixed, the earth passes successively from one part to another part of them.

Why is there twilight?

Because the sun's light is reflected from higher objects after he sets or before he rises, as from high hills, mountains, clouds, and the upper atmosphere, for an hour or more.

Why does the sun rise in the east?

Because the sun as to the earth is fixed, and the globe of the earth turns round from west to east.

Why does the sun set in the west?

Because the earth in turning round is then carrying us from the side in which the sun is to the opposite or dark side.

Why is it noon at 12 o'clock?

Because between the sun's rising and setting there is a middle time, and that middle time is called

noon, there being as many hours and minutes from sun-rise to noon as from noon to sun-set.

Why do the clouds appear concave, that is, high over head and touching the ground at a distance?

Because they are parts of a sphere, and their concave figure exactly displays the convexity of the surface of the earth to which they are every where parallel.

Why do we not see the hull of a ship when a great way off at sea, and only the tops of very distant mountains?

Because the spherical or round figure of the earth intervenes between the eye and the hull, or the base of the mountain.

Why do surveyors in levelling for roads and canals allow 8 inches in a mile, below the level of the sight?

Because they are obliged to allow so much for the roundness or convexity of the surface of the spherical earth.

Why do ships that sail from England in a westerly direction, by continuing to sail westerly, arrive again in England?

Because, as the earth is round, a ship must go round it by continuing to sail long enough in the same direction.

Why do they lose a day during their voyage in their reckoning?

Because they go from the sun, which passes from east to west, and, by sailing westerly, their noon every day is a trifle later.

Why is it not the same hour at different places at the same time?

Because, as the earth is a globe enlightened by the sun, it must be mid-day at some places when it is midnight at opposite parts of the globe; in other places morning or sun rising, and at others evening or sun setting, the 24 hours being divided between the entire circuit of 360 degrees.

Why is it 360 degrees round the earth, and the same round the heavens?

Because it is convenient to adopt some general division, and the ancients adopted 360 as the nearest even number to the days in a year. It is merely the division of any circle into 360 equal parts, let the parts be of whatever length they may.

Why is a degree of latitude on the earth 69 miles and one twelfth?

Because the distance from the equator to either pole is the 4th of 360, or 90 degrees; then the length of these 90th parts by measurement is found to be 69 miles and one-twelfth nearly.

Why are the central parts of America called the West Indies?

Because, when first discovered by Columbus, they were by mistake considered as part of India, and they were since called west, and ancient India east.

Why is America called the new continent?

Because it was unknown to the civilized world, till it was discovered by Columbus in 1492.

Why are certain parts of the earth called tropics?

Because the sun passes vertical, or directly over head, twice in the year. They are a space 23 ½ degrees on the north and south sides of the equator.

Why are certain parts of the earth called the poles?

Because the earth turns like a top, and the line down the centre of the globe is called the axis, the

two ends of which are the Poles, one North and the other South.

Why do we call one the top and the other the bottom?

Because we are apt to consider what is over-head as at top, and what is under foot at bottom, but in the whole round earth there is no top or bottom. The centre is the general under-foot, and the distant stars are the over-head every where.

Why are figures put round maps?

Because we determine by those at the sides the latitude or distance from the earth's equator, in degrees and parts of degrees; and those along the top and bottom are the distance from the meridian of Greenwich, if an English map, or from that of Paris if a French map.

Why is the little ° used after certain figures?

Because it is adopted as a substitute for the word degrees: thus 5 ° means 5 degrees; 5 ′ is 5 minutes, and 5 ″ is 5 seconds.

Why are there bones in animal bodies?

Because they give strength to the system, and in insects, which have no internal bones, the hard shelly covering is equivalent in its uses to internal bones.

Why have animals muscles?

Because muscles are fastened to the bones, and by contracting and expanding in length they move the bones.

Why are there nerves in animal bodies?

Because the muscles require direction, and the nerves issue from the brain, or seat of the senses of seeing, hearing, &c., which direct the muscles by the nerves issuing from the brain.

Why are there blood-vessels ?

Because without the circulation in them the nerves and muscles would lose their power and energy of action. The blood and its circulation are the support of life and energy in the nerves.

Why cannot animals live without breathing fresh atmospheric air ?

Because the air taken into the lungs by twenty inspirations per minute restores the energy and activity of the blood as it passes through the lungs.

Why do some insects live without lungs ?

Because the same purpose is performed by air tubes, which in like manner invigorate the circulating fluids, and these the nerves.

Why do fish live in water ?

Because they extract the air from the water by their gills, and because they are provided with an air bladder, to restore which they frequently come to the surface for fresh air.

Why is there a chain of existences, mineral, vegetable, and animal ?

Because one sustains the other, animals subsist and grow out of vegetables, and these out of minerals. Vegetables are intermediate, between minerals and animals.

Why is cotton preferred in modern fabrics ?

Because it is so prolific, so cheap, and so susceptible of every degree of fineness in spinning, weaving, and finishing.

Why is some spun sheep's wool called worsted and some yarn ?

Because separate threads of the wool are more twisted for the *worsted,* of which stockings and stuffs

are made, than for the *yarn*, of which cloth, blankets, carpets, &c., are made.

Why are skins tanned?

Because the unctuous or oily parts would become putrid, and tanning substitutes an astringent infusion of oak-bark in the pores, to purify, preserve, and strengthen the skins for use as leather.

Why is weaving adopted?

Because there are few natural substances adapted for clothing. The first weaving was the crossing of coarse vegetable fibres in matting. Then the spinning of the finer fibres was adopted, and the loom to cross them by the shuttle. Preparing, weaving, dyeing, printing, and finishing cotton, wool, flax, and silk, employ a fourth of our population.

Why is flax rotted in water?

Because the fibres contain much mucilaginous matter, therefore the fibres are soaked, beaten, combed, spun into threads, woven in the loom, bleached, and then made into fine linen.

Why are different names given to threads in the loom?

Because they have different uses. Threads in the length are called the *warp*, and separated by the reed and worked in alternate sets by the treadle; while the cross threads or *weft* are passed between them by the shuttle.

Why do we import foreign goods?

Because we want the production of other climates either for use or manufacture. Some countries produce cotton, others silk, others flax and hemp, others sugar, tea, coffee, &c.

Why do we export our productions?

Because we manufacture the cotton, silk, flax, and

then export those fabrics at a profit for the labour and skill, by which we pay for our own consumption of those articles of use and luxury which have been imported from other countries.

Why is England a manufacturing country?

Because it has a greater supply of coals than other countries to work steam-engines, and because steam-engines and spinning machinery were native inventions. Also because iron is very abundant in England for making all kinds of machinery.

Why are colonies promoted?

Because they grow and supply articles for which the climate of England is not adapted, as cotton, sugar, coffee, spices, &c.

Why is iron heated before it is wrought by blacksmiths?

Because when hot it is soft, and will bend into any form. Further heat in a furnace melts it; it is then as liquid as water, and may be cast in moulds into any desirable shapes.

Why are great bellows used by smiths, and in iron-furnaces?

Because the more air or wind goes into the fire, the more oxygen comes into contact with it, and heat depends on the fixing of the oxygen.

Why does hot iron make scales that fly about when it is struck with a hammer?

Because the oxygen in the air having combined with the iron makes rust, which rust is the scale, and it consists of oxygen and iron.

Why is paper wetted before it is printed upon?

Because there is oil in the ink, and the oil does not spread on the wet paper.

Why do we eat?

Because we perspire or evaporate constantly, and should waste away if not continually restored by fresh matter put into the stomach, for digestion and assimilation.

Why do we drink?

Because liquids not only contain nutriment to restore what is lost by evaporation, but they assist the digestion of solids in the stomach.

Why is moderate and simple diet to be preferred?

Because the stomach or digestive organ is limited in size and power, and the solvent powers of its juices are adapted only to simple diet.

Why are we hungry?

Because the stomach contains a powerful liquid, called gastric juice, which, when the stomach is empty, gnaws even the stomach itself.

Why do we sleep?

Because the exertions of mind and body exhaust the powers of the nerves, muscles, and fibres, and in sleep they recover; while food then assimilates, and restores what exertion had exhausted.

Why do we sneeze?

Because some foreign substance irritates the nasal passage to the wind-pipe.

Why do we cough?

Because some foreign substance has found its way into the wind-pipe, and by coughing it is expelled.

Why do we blow cold air and breathe hot?

Because we blow air just inspired into the mouth, and breathe the air that has passed through the lungs.

Why do men and animals dream?

Because they sleep imperfectly, and their thinking faculties are in action, while the powers of volition are at rest.

Why are part of their faculties awake?

Because certain functions are exercised in sleep, as digestion; and the stomach is intimately connected with the brain, the seat of thought.

Why do men walk in their sleep?

Because their organ of volition is awake while their reasoning powers are asleep.

Why is meal made into bread?

Because the form is more convenient than as grain or flour, or mere paste. The yeast ferments and swells it, the baking expels the water, and it is then in a form convenient for use.

Why are vegetables nourishing?

Because they contain farina, meal, or starch, which in the stomach assimilates to the system with most advantage.

Why are some vegetables preferred to others?

Because some contain more farina or starch, or saccharine matter—as wheat, potatoes, rice, peas, beans, rye, oats, barley, carrots, beet, sugar-cane, fruits, &c.; which "herbs yielding seed" were in Genesis (chap. i. ver. 29) ordered to be the food of man.

Why is barley malted?

Because the heat makes it partly grow or germinate, by which process its substance is converted into saccharine matter, and better adapted to fermentation and nutriment.

Why are fermented liquors made?

Because all vegetable substances containing saccharine matter, or sugar, ferment when dissolved in

water, and by fermentation produce spirit or alcohol, which is exciting to the stomach and nervous system.

Why does milk become butter and cheese?

Because milk is composed of animal oil, which rises to the top as cream, and this by agitation separates into the oily parts or butter; and it also contains mucilage or gum, which is curdled by putting rennet into it, and the curds make cheese.

Why is butter nourishing?

Because it contains much oil, and is a sort of solid oil; for olive oil, cocoa-nut oil, and palm oil, are very nutritive, while the oil from flax, rape, hemp, &c., as less palatable, is used in manufactures.

Why is gum nourishing?

Because it contains mucilage, which assimilates with the system, and all vegetables contain more or less mucilage, forming jellies, &c.

Why is tea used?

Because it gives an agreeable flavour to water, and is slightly astringent to the stomach; but it affords no direct nutriment.

Why are there winter and summer?

Because the earth, in going its annual course round the sun, does not move in the same plane or level, and therefore in one part the sun is perpendicular north of the middle or equator; and in another part of the orbit the sun is perpendicular south of the equator. The difference is 47° or 3300 miles on the surface. Then summer or winter depends on the side over which the sun is perpendicular.

Why are the days of such different lengths?

Because the sun always illumines just half the globe; but when perpendicular to the north of the

equator, the illumined part to the north is larger than the dark part, and we have to turn longer in the sun-shine. But the effect is then reversed in the south. So when the sun is perpendicular in the south, the effect is reversed in the north and south.

Why does the moon increase and decrease?

Because the moon is enlightened by the sun, and in different positions we see more or less of her enlightened side, varying as she moves in her orbit round the earth.

Why is it hotter in some countries than in others?

Because the heat of the sun depends on its being more or less directly over head (or vertical), and this varies according to distance from the equator towards the poles.

Why are degrees of longitude generally less than degrees of latitude?

Because the parallel circuit of the globe becomes less and less as we approach the poles, though every circuit is 360 degrees, therefore the degrees are less and less in miles. At the equator they are 69½th, but at 25 degrees of latitude from the equator they are but 62 miles; at 50 but 44 miles; at 75° but 17⅓rd; and at 89° but 1⅓th miles.

Why are there cardinal points?

Because it is necessary to agree in our descriptions; and we call the point SOUTH, where the sun is at noon; the directly opposite NORTH; the part where he rises EASTWARD, and where he sets WESTWARD. With the back to the sun at noon you face the north, and to the right hand is EAST, and to the left hand WEST.

Why is the east so much reverenced?

Because most barbarous people worshipped the sun

as a divinity, under the name of Baal or Bel, and they therefore reverenced the part of the horizon where he rose on them.

Why do the earth, moon, and planets, move in orbits nearly circular?

Because they are acted upon by two forces, one which tends towards the centre of their orbit, and the other which carries them in a tangent to the orbit; and, between both, they are carried in a diagonal, which becomes the orbit.

Why do they turn round on their axes?

Because the tangent force, mentioned in the preceding paragraph, carries them beyond a straight diagonal into a curve; and, in doing so, affects the outer hemisphere, and turns the planet on its axis.

Why do we conclude that the earth goes round the sun, and not the sun round the earth?

Because, as we know that the sun is 93 or 94 millions of miles distant, so its size must be 1,300,000 times greater than the earth. Besides, we know of 9 other moving planets, all of which, like the earth, go round the sun. One moon attends the earth, but Jupiter has 4 moons, Saturn 7, and Herschel 6.

Why do we call the stars fixed?

Because they never change their places in regard to one another. Catalogues have been made of 27,000, and 1500 may be seen with the naked eye. But the nearest is above 30 millions of millions of miles distant. Seen in telescopes they are innumerable, and nearly in the same absolute places.

Why do heavy bodies fall towards the centre of the earth?

Because the simultaneous annual and diurnal motions govern every part, and the greater annual fixes the centre; while the opposite sides are exactly

balanced by the rotation. Therefore the sides act against each other through the centre, and the annual motion, 98,163 feet per second, divided by 6102, the whole rotation per second, gives nearly 16 feet and an inch for the fall of a body per second.

Why is a stone heavy?

Because it moves or tends to move towards the centre of the earth with a velocity of 16 feet and an inch per second. Heaviness or weight is force, and all force arises from motion in a particular direction, or from some other motion causing a motion.

Why are there tides?

Because the earth and moon act and re-act on each other; and the action of the moon is first displayed on the *moveable* waters of the earth, so that the tides are governed by the position of the moon.

Why are there two tides in 24 hours?

Because the two sides of the earth must always exactly balance, and, when the waters are raised on one side, they rise on the other side to maintain an exact balance of the two sides. The waters yield because they are so mobile.

Why is the sun masculine and the moon feminine?

Because the ancients considered all the heavenly bodies as gods or goddesses, and they assigned Apollo to the sun, Diana to the moon, Mercury to one planet, Venus to another, &c.

Why are agriculture and horticulture the first and most honourable employments?

Because they provide men with food by their labours with the plough-share, or coulter, or with the spade for turning up and fertilizing the soil

Why are hedge enclosures useful?

Because they break the force of the winds, shelter the land from bleak winds, and concentrate the sun's heat.

Why is fallowing or rest necessary to land?

Because the fertile products which the soil derives from the oxygen and nitrogen of the atmosphere become exhausted by successive crops.

Why is animal food so dear compared with vegetable?

Because an acre of land produces but 10 ounces of mutton and 8 ounces of beef per day, while of many vegetables it produces from 40 to 100 pounds.

Why is some grain called a winter crop and others spring?

Because wheat and rye sown in autumn stand through the winter, but barley and oats are sown in the spring.

Why is wool called the staple of England?

Because it formerly was so, and it used to be sold in markets called staples; but latterly the Saxony and German wools, which are finer than English, are preferred for all fine cloths.

Why are barley and oats cultivated in preference to the more valuable grain, wheat?

Because barley succeeds on light poor soils, and oats on poor and damp soils, where wheat would not thrive.

Why are green crops cultivated?

Because turnips, clover, tares, and vetches, restore the land after a crop of grain instead of fallowing; one crop for man and one for cattle being the farmer's rotation.

Why are some grasses called artificial?

Because they are cultivated from seeds, and are so

distinguished from ancient natural herbage, the species of grasses being above 100.

Why do vegetables begin to grow in spring?

Because heat revives their natural mechanical energies after the sleep of winter, and, the air-vessels expanding, the juices ascend from the roots and invigorate the plant.

Why do leaves fall off in Autumn?

Because the powers which produced them in spring are exhausted; and because as the cold increases fewer juices ascend from the roots to feed and support them.

Why do they produce fruit?

Because fruit contains the seed of future plants and trees; and what we call fruit is the covering and food of the seed or young plant.

Why is not every season equally productive?

Because most things which are cultivated are not natives of the country, and the climate does not in every season suit them. Most of the agricultural products of England have been brought in former ages from warmer climates.

Why is hot water for many purposes preferred to cold?

Because its heat is owing to activity, and the more active hot water divides the parts of substances, and makes a stronger infusion.

Why are coffee-berries roasted with butter?

Because the process increases the flavour, and renders the berries fitter for grinding.

Why will not tea, coffee, and sugar, grow in Europe?

Because coffee and the sugar-cane require a hotter climate; but tea has not yet been tried.

Why will not grapes make wine in England as well as in France, Spain, and Portugal?

Because the summer is not long enough, and British grapes become ripe enough, for wine, only in expensive hot-houses.

Why does rain or water promote vegetation?

Because it constitutes the basis of their sap, and combines with mineral or earthy substances, so that when the roots absorb the solution they secrete juices, which are then modified in the sap-vessels by the action of the leaves on the atmosphere.

Why are animal bones and excrements so useful as manure?

Because they contain ammoniacal salts, which are the essentials of good manure, and the stimulants of the roots and seeds of vegetables.

Why is there such an infinite variety of animals and vegetables?

Because there is an infinite variety of situations and circumstances for their sustenance and support; and the form and habits of each are adapted to the means by which it lives, and to the substances by which it is supported.

Why are packthread and cord so strong?

Because the fibres of hemp or flax are long, and, when twisted together, bind one another, and rub with a mutual force, which resists ordinary tension.

Why is iron or metal wire so strong?

Because the fibres and parts of the metal, like the fibres of hemp in cord, are *naturally* intertwisted, and bind each other even with more force than the *artificial* twisting of fibres of flax, hemp, silk, or cotton.

Why are some bodies called dense?

Because they contain more atoms than others of the same size. Thus there are more atoms in a cubic inch of lead than in a cubic inch of stone or cork; the lead therefore is denser than the stone or cork, and the stone than the cork.

Why are bodies called *rare?*

Because they contain fewer atoms in the same bulk than others. Thus cork is rarer than stone, and stone rarer than lead.

Why do dense bodies fall and rare ones rise?

Because a common force turns the whole earth, and higher bodies perform longer circles by the daily rotation than lower ones; hence dense bodies fall into smaller circles of the earth's rotation, and rare ones rise into larger circles.

Why does not the rotation throw them off in tangents?

Because they are at the same time subject to the greater orbit motion, above 64 times greater than the rotation, and between the two motions they fall or press towards the centre.

Why are bodies denser as we dig deeper, and rarer as we ascend?

Because all the parts of the same planet are forced as far as possible into positions in which different densities have equal force of rotation; and this depends on their distance from the common centre, or on the length of the circles which they perform every 24 hours, subject also to the orbit force.

Why does sand or gravel become stone, and wood coal?

Because they are pressed by the beds or strata above, and thereby rendered denser and denser in long periods of time.

Why do we use the term specific gravity?

Because it expresses the weight, gravity, or number of atoms in the same bulk of different species of matter; thus 1 cubic inch of platinum is equal to 20 inches of water, and 1 of gold to 19 of water; while one cubic inch of water is equal to 830 of air, and to 10,500 of hydrogen gas.

Why do we fill balloons with hydrogen gas?

Because it is the rarest bulk known, being 13 times rarer than air, and it therefore rises with weights attached to it 4 or 5 miles high.

Why does a balloon move faster than the clouds?

Because it is lighter than the clouds, and also smaller; for small clouds move faster than very extended ones.

Why do birds fly, and fish swim?

Because the birds act against the air with their wings and tail, and fish against the water with their fins and tail. The wings of birds are largest, because the air is rarer than water; but both go forward like a boat rowed by oars, directed by their tail as a rudder.

Why is air necessary to fish?

Because they breathe it through their fins; and their air-bladder acts by dilating or contracting while they ascend and descend in the water.

Why do winds blow?

Because the sun rarefies the air by his heat on the earth's surface, by which it rises, and denser air always flows to the parts.

Why do we call some winds trade winds?

Because they follow the sun from east to west, between the tropics, where he is vertical or nearly so. These then disturb the whole atmosphere, and irregularities are created by mountains, by the variable heat of land, by rains, cold, &c.

Why does it rain?

Because the clouds collapse by cold, and, the little vesicles of vapour running together, they become more dense than air, and fall in preference to it.

Why does it snow?

Because the cold, which collapses the drops, is severe enough to crystallize them at the same instant.

Why does it hail?

Because, after being formed in drops, while falling they are frozen into small lumps of ice, and the sudden compression often creates the electrical actions of lightning and thunder.

Why is there more rain in Ireland than England, and more in the western counties than the eastern?

Because the Atlantic Ocean is westward, and westerly winds prevail 260 out of 365 days; then the Atlantic vapours and clouds fall first over Ireland and the western counties, and the eastern are watered only by a remainder. In consequence 50 inches of rain fall in a year in Ireland, 44 in the western counties of England, and only 30 and 25 in the eastern, and, more easterly, not above 20.

Why does it not rain in Egypt and Peru?

Because Egypt is remote from any sea, the clouds of the Atlantic being carried westerly by the trade winds, and those from the Pacific being intercepted by the mountains of Thibet and Tartary; and in Peru the Andes intercept the clouds from the Atlantic, while the trade winds carry the clouds of the Pacific from the Peruvian coast.

Why does the salt sea produce fresh vapours?

Because the degree of heat which vapourizes the water will not vapourize the salt.

Why is the sea salt?

Because it washes and turns up vast beds of rock

salt; for by the preceding paragraph it appears that the salt is one thing and the water another.

Why are there salt springs?

Because the sea, at high tides, has flowed over and formed lakes on the spot, which drying during low tides have deposited beds of salt, that impregnate the usual springs; so that the sea dissolves some beds of salt and again forms others.

Why does a rainbow appear during a shower?

Because when it rains, and the sun shines, the effect is the same as when a candle is held before a glass chandelier. The reflections produce all kinds of colours, and drops of rain falling from a cloud are in this case like the glass drops of a chandelier. If the sun or the candle does not shine on them, there are no regular colours.

Why do they appear as a bow, so regular?

Because the light in either case, the sun or candle, proceeds from one point, which becomes a centre to all the reflections in the eye of the same observer. Every observer makes a different centre, and sees the same colours in a different set of drops. A chandelier makes a bow as well as rain, only there are not drops enow to make the circle continuous. A shower-bath by candle or sun light makes an exact bow, and fountains do the same.

Why are there two bows?

Because one is made by single reflections from the drops, at an angle from the eye of 42 degrees; and the outer bow is made by a double reflection, at a larger angle or 54 degrees. But in two reflections much of the light is lost, and therefore the outer bow is fainter. The colours are reversed as to each other by the effect of one and two reflections.

Why do different reflections present different colours?

Because it is an affair of the eye and the sensation. Different reflections give different intensities or force to the atoms which produce the effect in the eye, and these varied effects we agree, by experience, to call by different names of colours.

Why is light turned into a new direction in passing from one transparent medium to another?

Because every body has, at its surface, its own local atmosphere, and also its own parallel structure; and these atmospheres, and different parallel arrangements of the parts, affect its course in passing in a straight line from one medium to another.

Why does so delicate a body as light pass through solid transparent bodies?

Because the regular structure in crystals, or thin plates, of many bodies, permits reflections to take place from part to part, and these are called transparent. Irregular or unequal structures are opaque. But there is opacity, in degree, even in the most transparent bodies, and much of the light is lost and scattered by them. The sea is dark at the depth of 2000 feet, and glass is black in a thickness less than 100 feet.

Why do telescopes and microscopes magnify distant objects?

Because they form an image in the focus of the object-glass, in which the rays of light are crossing, at an angle, and then this picture may be viewed by an eye-glass of very short focus. Without such image the rays come parallel, and cannot be viewed with an eye-glass.

Why do they form an image?

Because a regular convex surface is like a multi-

plying glass with an infinite number of sides. A multiplying glass with 6 sides shows 6 distinct images, but a convex glass gives so many images that they appear as one image, which is increased in size as the convexity or angle of vision is greater or less.

Why is a certain distance from a spectacle or telescope glass called its focus?

Because, if presented to a distant object, it makes a true picture of the object on a white wall at the focal distance.

Why do old persons wear convex spectacles?

Because their eyes are too flat, and convex glasses converge the light.

Why do short-sighted persons wear concave glasses?

Because their eyes are too convex, and concave glasses disperse the rays.

Why is light said to pass in rays, and so swiftly?

Because some philosophers consider light to be travelling atoms, which move from a luminous body at the rate of 12 millions of miles in a minute, and the constant succession of these they call a ray; but others deny the travelling at that rate, and maintain that space is nearly full of such atoms as produce the effect of light, and that an affection at one part is protruded and radiated in lines through the whole.

Why does light produce a halo, as those round the moon?

Because the atmosphere is filled with vapour, not dense enough to obstruct the light, but dense enough to produce regular sets of reflections at certain angles from the eye. A candle seen in a room full of steam produces the very same phenomenon.

Why is not light of one colour?

Because in passing through the atmosphere, in

coming into contact with various bodies, and in passing through others, it suffers various modifications.

Why do the modifications produce different colours

Because the colours are in the sense of perception. Colours are like tones in the ear, and depend on the force of the impression. The greatest force is scarlet; the least, violet and indigo. The medium is agreeable green. Light is variable force, sound is variable force, and colours and tones depend on our sensation.

Why does the air press every thing?

Because it is heavy, though 830 times lighter than water; and this weight is equal to a height of 5½ miles, or thirty-four feet of water in a pump, for so high it raises water and no higher. Again, it is elastic, and presses with equal force in every direction.

Why don't we feel it?

Because it presses every way alike: Downwards, upwards, and on all sides; but we behold its effects in a thousand things, in capillary tubes, in the absorption of sponges, in sugar with water, &c. &c., all of which act on nearly the pump principle, but intercept the pressure only on one side.

Why does the quicksilver rise in a barometer?

Because the air is drawn out of the tube, just as in a pump bore, and then the mercury rises 28, 29, or 30 inches, equal in weight to 33 or 34½ feet of water, varying with the elastic pressure of the atmosphere, as shown by a scale on the barometer.

Why do we call it a vacuum under the receiver of an air-pump?

Because good pumps reduce the air to a 3000th part and more.

Why does a squirt or a sponge draw up water?

Because a vacuum is made when the handle is drawn back, and the water is pressed into the vacuum by the pressure of the air on the water.

Why does a piece of wet leather raise a stone?

Because it forms a vacuum, and is made to adhere to the stone by the pressure of the atmosphere.

Why does a pump raise water?

Because the atmosphere presses by its weight and elasticity on every surface 15lbs. per square inch, therefore on the surface of water. If, then, a hollow cylinder is put into water, and the air extracted by drawing up a tight piston, so as to take off the pressure on the water in that part, the general pressure on the water drives a column of water after the piston up the cylinder.

Why does smoke sometimes rise straight?

Because the air is then denser than usual, or the smoke is comparatively rarer.

Why does a piece of metal and a feather fall together in an air pump?

Because there is no air to resist the fall of the bulky feather.

Why does a steam engine act?

Because a vacuum is made in the piston, just as in the pump and barometer tube, and then the weight of the air, about 15lbs. to the square inch, pushes down the plug into the empty piston.

Why is steam employed in the steam engine?

Because it displaces the air, and when condensed there is a vacuum in the space.

Why is steam of water preferred?

Because steam is easily condensed by sprinkling cold water in it, so as to make a vacuum in a space previously filled with steam. The piston is filled

with steam, and this keeps up the plug, which fits the piston, and easily rises and falls in it. A jet or stream of cold water condenses it, makes a vacuum, and then the weight of the atmosphere drives down the plug, with a force of 10 or 12lbs. to the square inch acting on the plug.

Why is there a great beam?

Because, when the plug goes down with force, it is fastened by a rod to a beam, and it pulls the end of the beam after it, and lifts the other end of the beam with the power of the engine.

Why is its power measured by horses?

Because horse power is known, and about equal to that of 5 men; and in a low-pressure engine a plug of 10 inches diameter is $10 \times 10 \times .7854$, or $78\frac{1}{2}$ inches, which, at 12lbs. to the inch, has a power of 942 pounds at every stroke.

Why are steam engines used in mining?

Because they raise the water which breaks in on the miners, who, without their aid, could not continue their workings.

Why is the Roman religion called Popish or Catholic?

Because it is taught and supported by the Bishop of Rome, called Papa, Father, or Pope; and because, in the hope of making it universal, he calls it Catholic, which means universal.

Why are other Christians called Protestants?

Because in the 16th Century, when they separated from the church of the Bishop of Rome, they *protested* against what they considered the errors and practices of that church, calling themselves Reformers or Protestants.

Why are some Protestants called Lutherans?

Because they respect and believe the practices and doctrines of Martin Luther, a courageous preacher in the 15th century.

Why are some Protestants called Calvinists?

Because they respect the doctrines of John Calvin, a French preacher at Geneva, in the 16th Century.

Why are some called Church of England men?

Because they are attached to the Church of England, established by law in the reign of Edward VI.

Why are other Protestants called Arminians?

Because they follow the doctrines of Arminius, a Dutch preacher of celebrity in the 17th century.

Why are other Protestants called Wesleyans?

Because they respect the practices and doctrines of John Wesley, a very industrious English preacher, who died in 1791.

Why are others called Baptists?

Because they inculcate the practice of baptism at adult age, and condemn infant baptism.

Why are others called Presbyterians?

Because they govern their churches by elders, or presbyters, instead of Bishops, Deans, Chapters, &c.

Why are others called Unitarians?

Because they teach the unity of God, and regard Jesus as a prophet, but not equal to God.

Why are others called Trinitarians?

Because they teach that God consists of three co-equal persons, or a trinity of Father, Son, and Holy Ghost.

Why are others called Quakers?

Because their first preachers, in the reign of Charles the Second, were remarkable for shaking or quaking

when they addressed the people under the influence of the Spirit; and hence the term Quakers was adopted as a reproach. Their true denomination is that of *Friends.*

Why are others called Independents?

Because they maintain that every Christian congregation is by itself independent of every other, in rules, faith, and practice.

Why are some men called Deists?

Because they believe in God or the Deity; but do not believe in any revelation, inspiration, or prophets.

Why are some called Swedenborgians?

Because they believe in the doctrines of Emmanuel Swedenborg, who died about 1778, and professed, by a new inspiration, to explain the doctrines of the Old and New Testament.

Why are the people of Turkey, Persia, Arabia, Egypt, &c., called Mahometans?

Because they believe that Mahomet, who published his doctrines in a book called *Al Koran,* about 630, was divinely inspired, and they worship God under the name of *Alla,* according to the precepts of Mahomet, as his prophet.

Why are there a scattered people called Jews?

Because their country of Judea was conquered by the Romans, and taken from them for repeated rebellions in defence of their religion, taught by Moses; and they now maintain their religion and customs in all countries, acting as brokers, money-dealers, and itinerant traders.

Why are the Hindoos called Brahmists.

Because they worship God under the name of *Brahma,* and believe that he has eight times visited the earth in human forms or incarnations; and they

chiefly abstain from all animal food as a pollution, living on rice, grain, and fruits.

Why are some clergymen of the Church of England called Rectors, some Vicars, and some Curates?

Because, when the clergyman receives both the large and the small tythes, the parish is called a *Rectory;* when the large tythes are separate property, and only the small ones are received by the clergyman, it is called a *Vicarage.* A Curate is the clergyman who does the duty for the Rector or Vicar.

Why are tythes received?

Because the church requires their support—they were granted by Ethelwolf 1000 years ago, for the maintenance of the clergy, the repairs of the church, and the support of the poor and helpless.

Why are there separate poor-rates?

Because at the reformation, in the 16th century, it was found that the great tythes had been in general taken from the clergy; and, as it was a primary duty to provide effectively for the poor and helpless, special laws were made for their separate provision.

Why is the Christian religion of Russia and the Eastern nations called the Greek Church?

Because in the early ages the Eastern churches denied the supreme authority claimed by the Bishop of Rome, and placed themselves under the Patriarch, or Bishop, of Constantinople.

Why ought we to be kind to the poor?

Because we ought to do to others as we would be done unto—riches and poverty being chances of birth, and results of circumstances, often independent of merit or demerit.

Why ought we to be kind to all animals?

Because they are in our power, and all should make a merciful use of their power; and because we ought to respect whatever the Creator has formed, and do to all inferior animals as we would that any superiors should do to us.

Why are men cruel, not only to other animals but to one another?

Because they are inconsiderate; for all cruelty arises from want of reflection, and is greater in animals to one another as they are lower in intellect; hence cruel men are always weak-minded men, and cruel from want of consideration, or from cowardice.

Why are kings and governors bound specially to protect the poor and helpless?

Because the rich and powerful are able to protect themselves, and the poor and helpless need protection from him who, being at the head of society, has nothing more to desire or covet.

Why is the ancient doctrine of four elements abandoned?

Because they are discovered not to be elements but compounds. Air has been discovered to be a compound of 21 oxygen gas and 79 nitrogen; water 15 of hydrogen to 85 of oxygen; fire is a mere effect of the union of hydrogen, oxygen, and carbon; and earths are not a simple substance.

Why is one Gas called Oxygen?

Because it is the part of the atmosphere which sustains life, fire, and acidity.

Why is another gas called Hydrogen?

Because it is the basis of water; it is also the light gas always necessary to combustion or fire, and 12 or 13 times rarer than atmospheric air.

Why is nitrogen called Azote?

Because alone it is fatal to animal life; though when mixed with 1 fourth oxygen it forms the salutary compound of atmospheric air.

Why is fixed air called carbonic acid gas?

Because it is oxygen gas combined with atoms of the inert substance called Carbon, and therefore heavier than oxygen, forming what is called the choke-damp in wells and cellars.

Why is the gas used in lighting called carburetted hydrogen?

Because it consists of carbon and hydrogen.

Why does a tile break to pieces when struck by a hammer?

Because the force of the hammer is greater than the force which held the parts of the tile together, and the remaining motion of the hammer is then displayed in the flying pieces of the tile.

Why does not a piece of iron when struck by a hammer break and fly about?

Because its parts cohere, or are bound together, with greater force than the force of the hammer.

Why does the iron become hot?

Because, as it does not break in pieces and fly about, the force of the hammer is in minute invisible parts, which fly about with such velocity as to create the sensation of heat, greater or less as the size of the hammer, and as repeated.

Why does water put on the piece of iron after the blows become gas, and the iron cool?

Because the water like the tile flies about, and the force of the hammer is then in its small atoms; but, as these rise into the air, the atoms of air turn them, so that between both forces, they form

little orbits, and are then gas, that is, atoms in circular motion.

Why does the re-condensation of this gas cause heat?

Because, in returning again to water, it parts with the motion that made it gas, and that motion is heat to other adjacent bodies.

Why are gases different?

Because they are formed in like manner from different substances, which, when exposed to any suitable excitement, fly off or radiate with velocity, and by the re-action of the air become gas, under different names.

Why does condensation produce heat?

Because, when the motion of atoms produces a large bulk, the bulk is reduced by taking away the motion from the atoms, and this motion is not lost, but imparted to other bodies or atoms. The motion which one body loses by condensation another gains and expands; and what one gains by expansion another loses, generally by condensation.

Why is burning or combustion an effect of the union of hydrogen and oxygen?

Because the two form water or aqueous steam, and the condensation is 600 times for the oxygen, and 10,000 for the hydrogen. Hence the great heat of their condensation to water and their flame when combining they are joined to any foreign body or carbon.

Why is carbon necessary to flame?

Because pure oxygen and pure hydrogen would combine, form water, and give out great heat, but little or no flame; some foreign substance, then involved in their action, disperses their condensed

motions as flame and light, or as heated atoms protruding others through vast spaces as light.

Why does an animal die under the exhausted receiver?

Because no animal can live without air, or the oxygen in the air.

Why will they not live in the air that remains?

Because it is carbonic acid gas, or fixed air, and chokes them instead of sustaining them.

Why does a candle go out under an exhausted receiver?

Because a candle cannot burn without air or its oxygen.

Why does a man before any exertion draw in his breath?

Because his strength for the purpose is in the air.

Why does a man become hot by exercise?

Because he breathes more, and combines more oxygen or motion in his lungs.

Why do bodies attract in electricity?

Because they are in a disturbed and separated atmosphere. The air consists of two principles, oxygen and nitrogen, and these by the excitement called electrical are separated, and, then seeking with force to re-unite, that force is sufficient to move light bodies from one affected side to the other affected side of the disturbed volume of air.

Why are there electrical conductors?

Because bodies so called are boundaries of the disturbance, and therefore the excitement passes along them in the air which is disturbed or separated. A conductor is equally powerful, whether silver paper covered with gold leaf, or solid metal. It is merely a boundary to the disturbed action in air, glass, or any electric or non-conductor.

Why is electricity called *fluid?*

Because, when a large surface is restored through a small point, the condensation makes it appear like a stream of fluid fire, as in lightning, &c.

Why is it called galvanism?

Because the electrical effects may be produced artificially, by putting oxygen and nitrogen, or any fluid containing them, between different plates of metal which the fluid differently affects.

Why is it called magnetism?

Because it is in a form which only affects iron, magnetic ore, and nickel, and is also connected with a similar action in the whole earth, which makes the prepared needles point towards the poles. Electricity, Galvanism, Magnetism, and Flame are different effects of the same general causes.

Why do coals burn and not stones, and why dry wood and not wet wood?

Because coals contain hydrogen and stones none; and because in wet wood the aqueous steam smothers the flame and scatters the heat of the oxygen.

Why does a candle or lamp require a wick?

Because the hydrogenous substance by ascending in the wick is presented to a larger mass of atmosphere, so as to facilitate the access of oxygen.

Why does not a gauze wire lamp set fire to inflammable gas in mines?

Because inflammable gas will not take fire without the force or contagion of flame, and the wire, as a good conductor of heat, diminishes the heat of the gas inflamed in the lamp. The idea was adopted from sticking a pin in a rush-light to extinguish it; the pin conducts away so much heat that the tallow ceases to be melted, and to rise in the wick.

Why are men choked in wells, &c.?

Because they are filled with fixed air, or carbonic acid gas, which extinguishes flame and life. It is the same heavy gas that is under a close inverted tumbler when a piece of candle has gone out under it, or when a small animal has died under it.

Why do bodies in cooling generally form crystals?

Because they adjust themselves in a fixed state, according to the forms of the atoms which compose them, and are packed by the pressure of the air.

Why are the numbers in Reaumur's thermometer less than Fahrenheit's?

Because Reaumur takes his freezing point at 0, and Fahrenheit at 32°, and R. his boiling at 80° and F. at 212°; hence R.'s degrees are 2½ of those of Fahrenheit. The summer heat of Fahrenheit is 76, and that of Reaumur 19½.

Why does a flint and steel light tinder?

Because by the blow the flint is set on fire and vitrified.

Why do spirits or ether relieve the pain of a scald or burn?

Because they evaporate quickly and cause great cold in the affected parts.

Why does water boil?

Because a certain quantity of heat, as 212°, tends to convert it into steam, and the steam which passes off still keeps it at 212°; then the effort of the whole to escape at once is repressed by that which in escaping equalizes the temperature, and creates the ebullition of boiling.

Why do spirits separate from water in distilling?

Because spirits boil at 176°, and therefore evaporate at that heat, and the water continues till 212°.

Why does water dissolve sugar, salt, or alum, and hot water dissolve quicker than cold?

Because the atoms of water after they cease to be ice are in great activity, and this activity is further increased by the excitement called heat.

Why is a plum pudding boiled, seeing that the water does not penetrate it?

Because it makes a space in the boiling water, and the steam penetrates it. All provisions are boiled by the mere penetration of the steam of the water adjoining them.

Why are potatoes roasted?

Because the motion of heat swells, gassifies, and breaks up their fibrous structure, and thereby adapts their parts better for the digestive powers of the stomach.

Why is heat called caloric?

Because the effect of heat was supposed to require a scientific name.

Why does breathing cause heat, and quicker breathing greater heat?

Because the oxygen drawn into the lungs forms carbonic acid gas, or fixed air, just as in the flame of a combustible; and the greater excitement in the inspired oxygen than in the expired fixed air is transferred to the blood in the lungs.

Why do we, to cool it, pour tea from a cup to a saucer?

Because cooling depends on the escape of certain atoms, by what is called evaporation, and this is increased by increasing the surface of the hot fluid.

Why does water not become hotter after it boils?

Because the excitement of the motion of its atoms

then escapes by evaporation as fast as the excitement which causes boiling is increased.

Why does water evaporate before it boils?

Because some of its atoms are smaller, or more sensible of excitement, than others, and the top becomes hotter than the bottom.

Why does not ice when melted become gas?

Because the air presses it with a force of 15lbs. to the square inch, and no fluid becomes gas till its internal force of expansion is greater than 15lbs. to the square inch.

Why do all bodies expand by heat?

Because all bodies have interstices, and these are filled with some gas, which, expanding by the heat, expands all the parts of the bodies.

Why does heat render metals and ice fluid?

Because it expands the gas in the pores of their smallest parts, converting other parts into gas, and these expansions, breaking up the general connection of the parts, separate them, and the excited gas in them keeps them in a fluid state.

Why does heat reduce other substances to dry powder?

Because these substances contained moisture, the expulsion of which breaks up the mass and leaves it dry grains. But if the heat is further continued these dry grains become fluid, and resemble melted glass.

Why are animals clothed with fur, wool, and feathers?

Because all these are slow or bad conductors of heat, and their systems require the accumulation and concentration of the heat which they generate in their lungs by respiration.

Why do some bodies feel cold?

Because they are good or rapid conductors of heat, and, by carrying off the heat from the skin which touches them, they are called cold.

Why do men wear clothing in cold climates?

Because, as man by his want of natural clothing seems to have been fitted for warm climates only, so in cold ones he wears bad conductors of heat in imitation of the natural covering of animals, to prevent the too rapid distribution of the heat generated by his respiration.

Why does it freeze on high mountains in the hottest climates?

Because heat depends on the reflection of the surrounding country, and the tops of mountains have not this surrounding reflection.

Why is it hottest between 2 and 4 o'clock in the afternoon?

Because the effects of the meridian sun have then accumulated.

Why is it coldest before sun rise in the morning?

Because the heat of the previous day has been dissipated during the night.

Why does a poker laid over an exhausted fire revive it?

Because the iron receives and concentrates the heat, and creates a draught of air through the fire.

Why does sun-shine extinguish a fire?

Because the rays engage the oxygen which previously supported the fire.

Why does a man and woman in a weather-house foretel dry or wet weather?

Because they move by a piece of catgut, which stretches and contracts as the air is moist or dry.

Why do not bells and gunpowder sound under an exhausted receiver?

Because there is no air to be acted upon, and to conduct the vibrations to the sides.

Why does water, or a long piece of timber, conduct sound better than air?

Because every substance whose parts vibrate conduct sound nearly in proportion to their density.

Why do musical strings move pieces of paper when only certain other strings are struck?

Because strings in unison vibrate together, and other strings vibrate only to those in unison.

Why does wind rush into a room at the bottom of a door and out at the top?

Because the cold air is lowest and the hot air uppermost, one seeking to come into a warm room, and the other seeking to get out.

Why has a smoke-jack its force?

Because the hot air ascends from the fire-place towards the top of the chimney, and acts on the vanes of the wheel.

Why is a thermometer marked with certain words?

Because at 0, or zero, it is extremely cold, at 32° at the freezing point; at 55° temperate; at 76° summer heat; skin heat, 92 to 97°; 98° blood heat; 106° fever heat; 176° spirits boil; and at 212° water boils.

Why is the whole range of a mercurial thermometer 600° above zero and 40° below?

Because at 600° mercury boils, and at 39 or 40 it freezes.

Why are the words fair, change, rain, &c., written on barometers?

Because when the air is dense, and the barometer

at 31 inches, it is called *very dry*; at 30½ *set fair;* at 30 *fair;* at 29½ *change;* at 29 *rain;* at 28½ *much rain;* at 28 *stormy*—but this depends on the rising or falling at the time determined by the convexity or concavity of the top of the mercury.

Why is the public debt called the funds and stocks?

Because at first it was a fund, and every man's share was called his stock. At present it is only an annuity of 3, 4, or 5*l.* for every £100, which annuity is paid to the proprietor out of the taxes.

Why was the public debt created?

Because the government of King William the Third required, for the expences of his wars, more money than could be raised by taxes within the year; annuities were therefore granted on future taxes to those who lent at once £100 to government.

Why have the amounts increased since?

Because other wars have, in like manner, required greater supplies of money than could be raised by taxes; so that nearly thirty millions of future annual taxes have been mortgaged to public creditors.

Why are some annuities called 3 per cent., some 4, and some 5 per cent.?

Because those were the terms of interest at which the money was originally borrowed.

Why is there a Bank of England?

Because its proprietors were the first lenders to the government of William the Third, and in consequence they receive all the taxes, and out of them pay the interest, or dividends, to public creditors.

Why is so much said about the price of stocks?

Because the price of the annuity of 3, 4, or 5 per

cent. is constantly fluctuating. In Decem. 1838, £94 must be given for 3 per cent. per annum, but sometimes not more than £60. The difference of price, from day to day, is called the fluctuation.

Why do the prices fluctuate?

Because several thousand persons, called stock jobbers, live by dealing in these annuities, and the speculations of these parties continually vary the prices.

Why are there turnpike tolls?

Because all roads have been made by private subscription, and the tolls are collected to pay interest or annuities to the parties; and also to defray the expences of keeping the roads in good order.

Why are there canal tolls?

Because canals were constructed by private persons, and the tolls pay them interest and keep the canals in repair.

Why is land the most important property?

Because it is always productive of the necessaries of life; and, when there was an income tax of 10 per cent., the land yielded above 5½ millions, houses but 2½, and trade not quite 4 millions.

Why is civil liberty so much prized?

Because wherever it does not exist, and the people have no control in making laws, imposing taxes, and restraining acts of power, they are oppressed without remedy, and subject to caprice and exactions which destroy all energies of mind and body.

Wy do people pay taxes?

Because they desire to be well governed, and to be protected by an efficient government.

Why does Parliament meet?

Because new or improved laws are required, and

changes of taxes are necessary, such being the powers and duties of Parliament.

Why are there elections?

Because electors ought to be enabled, from time to time, to reject unworthy representatives, and choose others more agreeable to them.

Why are judges controlled by jurors?

Because prejudices may influence judges, and persons indifferently taken from among the people give an assurance of impartiality.

Why are jurors required to be unanimous?

Because truth will insure unanimity, and without unanimity the decision would only be a probability. Thus, also, every one of the jury becomes personally answerable to his own conscience for the decision; for without his approbation it could not be made.

Why are counsellors employed?

Because every man who has to defend his life, liberty, or property, may not be eloquent enough to state his own case, and may not sufficiently understand the law on which his case depends.

Why are liberal laws more efficient than severe ones?

Because all men conspire to render illiberal or harsh laws inefficient.

Why is money described by Solomon as the root of all evil?

Because its portable and durable character enables men to hoard and accumulate more of it than they could of any goods or commodities, if portable and durable money had not been invented.

Why was money invented?

Because barter was often inconvenient, and an intermediate price in gold and silver aided transactions.

This was its use, but its abuses and the practices of usurers were not foreseen by its first inventors.

Why was gold and silver preferred for money?

Because they do not perish, are scarce, and cost, in mining and procuring, the price at which they pass current as coin.

Why are they alloyed?

Because an alloy of copper, &c., renders them harder than pure gold and silver, and fitter for the purposes of coin.

Why do things change?

Because all things are in motion, and motion changes the places of large bodies, and also of the atoms of which large ones are composed.

Why do things change which appear not to be in motion?

Because the atoms of air or water in which they are situated are in motion.

Why do some bodies change more than others?

Because their substance is of a kind more subject to the action of the peculiar atoms which compose air or water.

Why does air rust iron?

Because air consists of oxygen and nitrogen, and the oxygen combines with the iron, and this combination is rust, or oxyde of iron.

Why does water rust iron?

Because water consists of oxygen and hydrogen, and the oxygen combines with iron.

Why are coals found in horizontal beds under ground?

Because they are believed to be decayed forests, which have been overthrown and buried on the

spots where found, by the sea and other accidents of long time.

Why is this opinion formed?

Because their masses present the fibrous texture of wood; and leaves, and other fragments of vegetation, are found among them.

Why are standing trees often found in rocks and deep beneath the surface, and why are there vast beds of sea-shells and collections of unknown animals' bones found?

Because the earth has been subject to repeated submersions of the sea, and the sea has formerly covered tracts now the interior of countries.

Why are stones and soils in level and even strata?

Because they are gradual deposits or sudden settlements from water, and hardened into stone by long pressure upon one another.

Why is lime-stone burnt to make lime?

Because the fire expels the fixed air, and converts the solid lime-stone into loose powder.

Why does lime formed into mortar become hard again between bricks and stones?

Because it re-imbibes fixed air, and becomes again as hard as the original lime-stone from which the lime was formed at first.

Why was the fixed air expelled at first?

Because hard lime-stone would not form mortar or plaster (soft substances), until the fixed air was expelled, and then its power of re-imbibing it makes it a cement.

Why do we find sweetness in sugar, and sourness in a lemon?

Because they affect the sense of taste in such ways as to produce those sensations. The sweet

ness is not in the sugar but in our sensation; the sourness is not in the lemon, but in our sensation. There is no pain in a stick, or in fire, but the pain of a blow or of burning is in ourselves.

Why do all great rivers rise among mountains?

Because mountains intercept and precipitate the clouds which rise from the sea; and because, as mountains are the highest land and the land declines from their ridges to the sea, and as water always seeks the lowest level, so it flows in the lowest channels from the mountains to the sea.

Why are there springs?

Because there are extensive beds of clay and marble and rocks under ground, which not permitting the descent of the water, it accumulates and forms veins and channels on the surface of such beds, at different depths, rising towards the surface like a fountain when a channel or well is made for it.

Why does water rise in a fountain?

Because water has been raised to a considerable elevation, and is then brought by pipes to a lower level, and permitted to escape, by which it endeavours to rise to the height of the water whence it came.

Why do rivers run swiftest in the centre?

Because the sides rub against the banks and are delayed.

Why does rising mercury in a barometer or thermometer make a convex surface in the middle?

Because the sides rub against the glass.

Why does a string give a sound when struck?

Because it is fastened at both ends, and on being struck in the middle is stretched, but in returning to

its original position it vibrates and moves the air, and hence the sound.

Why does the moving of the air occasion sound.

Because every space is quite full of atoms in the condition of air, and when affected or moved in one part the same affection extends around.

Why does the extension of the vibration through the air give the sensation of sound?

Because the ear within the affected air is so constructed as to appropriate the vibrations, and convey them by delicate and curious mechanism to the brain, or seat of perception.

Why does a drum sound?

Because the stretched tympanum is fastened at the sides like a string, and a blow changes its line, while the return produces vibrations as in a string; the vibrations are visible to the eye, or made so by putting light bodies on the tympanum.

Why do musical glasses give sounds?

Because the substance vibrates just like strings, as may be seen in the water usually put in the glasses.

Why do wind instruments produce sounds?

Because the wind in passing out of them at an orifice vibrates the substance, which vibrates the air just as in a string or drum.

Why are tones different?

Because the air is a compound of different atoms, and these are separately affected by some vibrations more than others; short strings vibrate quicker than long ones.

Why are some tones dull and others acute?

Because strings loosely braced make few vibrations; it is mere noise when there are less than 30 vibrations in a second, and mere squeak when there

are above 7000 in a second. All tones in music are produced by vibrations between 30 and 6500 in a second of time.

Why do a meteor and a rocket leave a train ?

Because they move only in a right line, and do not also turn round.

Why does a horizontal water-wheel throw drops around ?

Because it only turns on its axis, and does not also move in a straight line.

Why do bodies on the earth fall to the centre, and form neither a train like a rocket, nor a circle of drops like a water wheel ?

Because the earth has two motions at the same time ; it turns round, and it also moves in a straight line ; and it moves in a straight line above 64 times faster than it turns round.

Why does the earth move from 64 to 65 times faster than the equator turns round ?

Because, if it moved only 4 times faster, bodies would neither rise nor fall. They would not disperse as from a water wheel, nor would they be left in a train like a rocket ; but the increase of direct velocity of 16 times more than the whole surface is the force with which bodies fall towards the centre.

Why have bodies this weight ?

Because thereby the whole earth is consolidated in a firm mass, and fit to counteract all deflections of animal or other local powers.

Why do bodies fall 16 feet and an inch in a second ?

Because the *whole* sphere turns in the ratio of 4 feet in a second, while it moves in a direct line in the orbit 64 feet 4 inches ; this divided by the 4,

by the 4, gives 16 feet and an inch for the velocity towards the centre in a second of time.

Why was the fall of bodies ascribed to a principle of gravitation?

Because the effect of two motions had not been considered, and a word synonymous to *weight* was adopted to describe the phenomena, not the cause.

Why is gravitation or weight sometimes called universal?

Because the fall of bodies at the earth, or their weight, was supposed to arise from some principle of all matter, and not from the two local motions of the earth itself.

Why do the other planets form solid masses, and neither radiate like water-wheels, nor leave trains like rockets?

Because they also are subject to two motions at the same time, and their parts therefore fall to their centres with force or weight severally, like the parts of the earth.

Why do two bungs floating on water go together?

Because they intercept the pressure of the air on each other.

Why do two logs of wood floating *in* water not go together?

Because they are not exposed to the pressure of the air.

Why does water rise up the sides of a vessel?

Because the sides intercept the pressure of the air.

Why do persons in a moving carriage or boat tumble forward if it suddenly stops?

Because they had previously acquired the motion of the boat or carriage. If travelling 10 miles an hour, they are moving with the same force as though

they had fallen 9 feet, and, if 22 miles an hour, with the same force as if they had fallen 16 feet.

Why does a man beat a coat when he wants to clear it from dust?

Because the motion of the blow drives forward the loose dust, and the coat is too heavy to be equally moved.

Why are all mechanical machines arithmetical?

Because power depends on velocity of motion, and the quantity of matter moved *multiplied* by the velocity always expresses the force exerted, and the power acquired.

Why do we call this the 19th century?

Because the 18 centuries since Christ have passed away, and the 19th is now passing. At the end of 1900, 19 centuries will have passed, and in 1901 we shall begin the 20th century.

Why do we date from the birth of Christ?

Because it is a more certain epoch than the deluge, which some fix 2348 before Christ, and others between 3 and 4000; or than Adam, which some fix 4004 years before Christ, and others carry back 5 or 6000 years.

Why is English history made to commence from the Norman conquest in 1066.

Because since then the sovereigns have continued in the same family. Egbert the Saxon became king of all England in 828, and the Romans left in 422. Claudius made the conquest in 44 after Christ, and Cæsar first landed in 55 before Christ; but all these are less marked epochs. The Revolution of 1688 was another epoch.

Why are decimals preferred to vulgar fractions?

Because the numeration of decimals exactly accords in operation with that of whole numbers, all figures to the left of the point (·) being 10 times more, and those to the right 10 times less.

2· is two, 30· is thirty, 400· is four hundred. But ·2 is two-tenths, ·03 is 3 hundredths, and ·004 is 4 thousandths. Hence 432·234 is four hundred and thirty-two, and two hundred and thirty-four thousandths.

Why is a fraction called vulgar?

Because it is any odd part which happens to arise, as thirds, or sevenths, or twenty-thirds, as $\frac{2}{3}$, $\frac{4}{7}$, or $\frac{5}{23}$, and all such are vulgar fractions.

Why are other fractions called decimals?

Because they are in equal tenths or hundredths, and are then capable of being operated with like whole numbers, as $\frac{75}{100}$, $\frac{2}{10}$, or $\frac{365}{1000}$, which are written ·75, or ·2, or ·365.

Why is a number called a *square* number?

Because it is some number multiplied by itself. Thus 4 is the square of 2, because 2 multiplied by 2 is 4. So 25 is the square of 5. Then 2 is the square root of 4, and 5 is the square root of 25.

Why is a number called a *cube* number?

Because it is a triple multiple of a number by itself. Thus 8 is the cube of 2, because 2 by 2 and this by 2 is 8. So likewise 27 is the cube of 3, that is, 3 by 3 is 9, and 9 by 3 is 27. Then 2 is the cube root of 8, and 3 of 27.

Why is a foot or inch called a square or cubic foot or inch?

Because it is a foot or inch on each side.

Why are such numbers used?

Because they determine all questions in mensura-

tion. Superficial measures are the multiple o. the sides, and solid measures are the cubes of the sides. They also determine many phenomena of nature, qualities and forces being diffused as the cubes of the distances; and surfaces are compared as squares, and solids as cubes.

Why is the term *inverse* used?

Because effects diminish or spread as distance increases, and therefore are weaker and weaker, and the term *inverse* implies this *decrease* of effect, while there is an *increase* of distance.

Why in travelling in a carriage, or sailing near the shore, do near objects move quickly, and distant ones but slowly?

Because the angle of motion is greater in the nearer than the distant ones; and the change of place, as to every object, depends on the angle which the space passed through presents at the near and the distant object.

Why has matter force?

Because it is moved; for force in the same body is as its motion. With twice the motion it has twice the force or momentum, and, with ten times the velocity, ten times the force or momentum. Quantity of matter multiplied by its velocity is momentum.

Why is time eternal?

Because there could have been and can be no existence without duration. Our measures of time are measures of motion in all cases.

Why is there power?

Because matter has motion, for we know of no power but matter in motion; therefore wherever any power appears there must be matter in motion, whether we can trace it or not.

Why is space infinite?

Because no bounds can be set to it—for, if it has a bound in any place, there must be something beyond, and we are thus obliged to add extension to extension on every side.

Why are the properties of the triangle so important?

Because by them we determine the distances of the celestial bodies, and solve problems in navigation. It ought to be known to all that the squares of the two sides of a right angled triangle are equal to the square of the hypothenuse; and that triangles with equal angles are exactly proportional to one another.

Why are the properties of a circle so important?

Because it solves so many problems in geography, astronomy, and mensuration. It ought to be remembered that the diameter is always to the circumference as 7 to 22, or as 1 to 3·1416.

Why is the square or rectangle so important?

Because it solves most problems in mensuration and land-surveying. The sides multiplied together are the area; and the square of the diagonal is equal to the squares of the two sides.

Why is the liberty of the press so desirable?

Because without it the human mind would be stationary, and no improvements would be made but such as it might be the interest or policy of governments to permit.

Why are universities so well endowed?

Because it is desirable that education should be carried to the highest degree of refinement, and that marks of distinction should, in the least questionable

forms, be conferred on those who have undergone rigorous examinations.

Why is the art of printing called a god-like invention?

Because it enables men to perpetuate, improve, and spread knowledge at an easy expense to every class of the community and from age to age.

Why do quacks succeed better than modest men?

Because they address themselves to the passions and credulity of the multitude, and by noisy pretensions make dupes of the unthinking majority.

Why does originality succeed less than mere imitation?

Because the generation passes away before originality is duly understood.

Why are prejudices and superstitions so lasting?

Because they belong to remote ages, and in every succeeding age are kept in countenance by the senior members of the community, who belong to the preceding age which cherished them.

Why is the belief in ghosts so general among the vulgar and uneducated?

Because there are diseases or imperfections of the organs of seeing and hearing which they do not understand; and therefore they ignorantly ascribe what is uncommon to supernatural agents.

Why is not truth always preferred to error?

Because it often opposes self-interest, pride, or the prejudices of education.

Why is truth obstructed?

Because it is more popular and profitable to flatter prejudices than to oppose them.

Why do books in general sustain errors instead of truth?

Because those books sell the best which support popular prejudices, and profit is the chief object of most writers and publishers.

Why are cruel and harsh laws inefficient ?

Because the moral feelings of all society oppose and thwart them, and produce sympathy even for criminals, when the penalty exceeds the crime. Liberal laws only, therefore, are effective, and illiberal ones defeat themselves, and are generally useless.

Why are titles conferred on men ?

Because they are to be considered as distinguishing personal merit—when titles of learning, they imply superior learning—and, when titles of honour, they imply superior honour. When conferred by mere purchase or by personal favour, without merit, they are a badge of disgrace rather than a title to respect.

Why is wealth so much honoured ?

Because the necessities of others render them desirous of sharing, and therefore they flatter and cringe to rich men ; and as wealth thus produces the outward show of admiration, and certain degrees of power and indulgence, it is coveted by all, though enjoyed by few.

Why does not wealth produce enjoyment proportioned to its increase.

Because the natural animal powers limit the means of enjoyment. A rich man cannot eat or drink more than a poor man—he cannot think more, and he has less occasion to think—while, if he indulge in costly luxuries, painful diseases leave him without any enjoyment and shorten life. No vice is more certainly attended by personal punishment and general contempt than inordinate covetousness.

Why is learning so necessary?

Because knowledge distinguishes between the vulgar and respectable, between savages and civilized men. There is no difference between a vulgar man and a gentleman, but in knowledge; and none between a wild savage and a European, but in knowledge.

Why is grammar and the study of language so useful.

Because grammar enables us to speak and write with propriety, and nothing more completely distinguishes between men or women in society than their different powers of speaking and writing correctly according to the rules of grammar.

Why is arithmetic so useful?

Because it treats of monies and quantities, and enables us to decide all kinds of questions connected with figures, and such questions are of hourly occurrence in every station of life.

Why is drawing so desirable an accomplishment?

Because it leads us to consider all objects with accuracy as wholes and parts, and brings us into a familiar acquaintance with the external world and nature.

Why is music so valuable an accomplishment?

Because it affords the most agreeable gratification to ourselves and friends, and the pleasure is much increased when its principles are thoroughly understood.

Why is geometry so useful?

Because it teaches all the relations of quantities and lines, and enables us to arrive at a correct knowledge of the perfect harmonies of nature, which are all geometrical.

Why is geography so important?

Because it describes to us the whole world which we inhabit. It brings before us all nations, and explains their sizes, positions, climates, productions, and also their peculiarities of manners, customs, dresses, religion, industry, &c. &c.

Why is astronomy so interesting?

Because it instructs us in all knowledge connected with the sun, moon, planets, and stars, objects always so grand and sublime, by studying which we understand more of the sublime universe than by any other means.

Why is the study of natural philosophy so proper?

Because it explains the mysteries of nature by which we are surrounded, instructs us in the connexion of one thing with another, and generally conveys competent ideas of the immediate causes of the wonders that surround us.

Why is a knowledge of history so desirable?

Because by its means we live as it were in all past time as well as in our own short span. We are by history introduced to the days of our fore-fathers, and we see in its pages the events of hundreds and thousands of years as in a mirror.

Why is the study of logic so useful?

Because it analyses the process of our faculties, and enables us to reason with precision and clearness on all subjects, and to detect the errors and sophistry by which, without logic, we are in continual danger of being seduced.

Why is the study of natural history so advantageous?

Because nature is so various, so wonderful, and so beautiful, that, with a knowledge of the elements of

any branch of natural history, we can never want agreeable amusement. Botany teaches the knowledge of plants; zoology embraces all animal life; and mineralogy is the science of rocks and metals.

Why do we call the planets erratic?

Because they are not fixed or always in one place as to the others. Four of them are often visible, Venus, Mars, Jupiter, and Saturn; Mercury very seldom; and Herschel is scarcely visible to the naked eye.

Why is Mercury seldom visible?

Because its orbit is so near the sun that it is seldom distant enough to be seen out of the blaze of the sun's light.

Why are Venus and Jupiter called morning and evening stars?

Because they are so brilliant as to command special attention after the sun has set, and before he rises.

Why is the rising sun so exquisitely beautiful?

Because nature has been veiled in night and the gloom of twilight, when suddenly the majesty of the sun presents itself above the horizon, gilding every object, and hailed by the singing of birds and the renewed activity of all animals and vegetables.

Why is not the setting sun as beautiful as the rising?

Because the transition is the reverse. It is the departure of a glorious object, and a change from light and visible nature to gloom, darkness, and the sleep of nature.

Why does the sun rise?

Because the part of the earth where we are turns

from west to east, with a velocity which, in the latitude of England, is equal to 1000 feet in a second, or between 10 and 11 miles in a minute.

Why does this velocity from east to west depend on latitude?

Because the whole earth turns in 24 hours, and the circles diminish all the way from the equator to the pole. The people at the equator turn nearly 25,000 miles in 24 hours, but in England we turn only 15,000 miles in 24 hours.

Why is one day of the week lost in every year, and two days after leap year?

Because 52 weeks make 364 days, and the year is 365 days, or 366 days, therefore one new year begins a day or two days later in the week than the preceding year.

Why does not the sun always rise due east and west?

Because in our summer it is nearer over head, and in winter lower by 47 degrees. It sets in our east and west only when midway, that is on March 21, and September 22, called the *equinoxes*.

Why are the longest and shortest days of different lengths in different latitudes?

Because at the equator only the solar horizon cuts in equal halves the circles of rotation, and therefore there the days and nights are always equal; but the horizon divides them more and more unequally as we go from the equator, till at the pole the equator is the horizon, and it then ceases to divide the rotatory circles.

Why do the longest days increase in length with the latitude of the place?

Because by the last answer the horizon of the lati-

tude divides the circles in the heavens parallel with those on the earth, more and more unequally, as we proceed from the equator; so that the circles round the pole, which never set, get larger and larger.

Why is there a certain star called the North Pole star?

Because it is very nearly perpendicular at the North Pole, therefore as to us on the rotating globe is always fixed; and all the other stars move round it in smaller or larger circles, corresponding to similar circles on the earth.

Why is it so useful to navigators?

Because it is always fixed and visible every where on the north side of the equator, always determining the true north point; while it is not less useful to young astronomers, who, by observing the motions of all the stars round it, will soon understand the motions of the earth and heavens.

Why is the system of the planets called Copernican?

Because it was explained in 1542 by one Nicholas Copernicus, a clergyman of Thorn, in Prussia, who then revived it from the works of very ancient philosophers.

N. B. The great success of this little work has led, as was anticipated in the preface, to several very paltry imitations; and unless the public would give encouragement to piracy and imposition, BLAIR'S WHY AND BECAUSE must be expressly ordered.

If Instructors of youth give due encouragement to this Part, the same author may, when leisure permits, be induced to prepare A SECOND PART, not less interesting and useful.

APPENDIX.

[*As this little work may be adopted in Families, and many First Teachers may desire to instruct Children at the same time in certain Tables and fundamental Figures while they are learning this little book, a few are added which cannot be too early impressed on the memory.*]

12 inches are a foot.
3 feet a yard.
220 yards a furlong.
8 furlongs a mile.
1760 yards a mile.
69½ miles a degree on the earth.
360 degrees round the earth.
24,889 miles round the earth.
7,916 miles the diameter of the earth.
93½ millions of miles to the sun.
240,000 miles to the moon.
880,000 miles the diameter of the sun.
2,180 miles the diameter of the moon.
144 square inches in a square foot.
4,840 square yards in an acre.
640 acres in a square mile.
4 roods one acre.
1,728 cubic inches a cubic foot.
277¼ cubic inches a gallon.
4 quarts one gallon.
10 pounds of water a gallon.
A pound weight is 27¾ cubic inches of water.
16 ounces are a pound.
112 pounds are a hundred-weight.
20 hundred-weights are a ton.
A bushel of good wheat weighs 60 lbs.
4 bushels are a sack.
2 sacks are a quarter.
A bushel is 2218⅜ cubic inches.

A second's pendulum is 39$\frac{1}{7}$ inches long nearly.
The French metre is 39$\frac{1}{2}$ inches nearly.
305 metres are 1000 English feet.
A league is 3 miles, or the 20th of a degree.
There are 365 days, 6 hours, 9 minutes, and 11 seconds in a year; also 52 weeks of 7 days.
January, March, May, July, August, October, and December, have 31 days; April, June, September, and November, 30 days;—February 28, but in leap year 29 days.
From full moon to full moon is 29 days 12$\frac{1}{4}$ hours.
Quarter days are March 25, June 24, September 29, and December 25.
London is in latitude 51° 32′ North.
Dublin is in latitude 53° 20′.
Edinburgh is in latitude 55° 58′, and 395 miles from London.
The first King of all England was Egbert, in 828.
Ireland was united by Henry II. in 1180.
Wales by Edward I. in 1283.
Scotland by James I. in 1603.
The Revolution took place in 1688.
The present King is William the Fourth, born August 21, 1765; and he succeeded George the Fourth, June 26, 1830.
America was discovered by Columbus in 1492.
Printing was invented about 1440.
Rome was built 753 before Christ.
David became king 1044 before Christ.
Moses died 1460 before Christ.
England and Wales are about 400 miles long and 250 broad.
Scotland is about 280 miles long and 100 broad.
Ireland is about 220 miles long and 160 broad.

England and Wales contain nearly 14 millions of inhabitants.
Scotland about 2¼ millions.
Ireland above 8 millions.
London contains 1,450,000 people, and is the largest town in the world.
England has 38 colonies in Europe, Asia, Africa, and America.
There are 2 archbishops and 24 bishops in England.
There are 658 members of the House of Commons.
There are about 415 members of the House of Peers.
Twelve honest men form an impartial jury.
The national debt is 750 millions.
The taxes are about 50 millions.
There are above 100 different languages.
There are above 1000 millions of people on the globe.
Welch is spoken in Wales.
Erse in the Scotch Highlands.
Gaelic in Ireland.
The English language is a mixture of Welch, Gaelic, Norman, French, German, Latin, and Greek.
There are 3 or 4 times as much sea as land.
The clouds are from a quarter of a mile to 7 miles high.
The highest mountains are 4 or 5 miles high.
The human body has 98 degrees of heat.
Water boils at 212 degrees.
Water freezes at 32 degrees.
Summer heat in England is from 60° to 90°.
Winter heat from 40° to 10°.
Water is 830 times heavier than air.

Gold is 19 times heavier than water.
Silver is 10 times heavier than water.
Iron is 7 times heavier than water.
The Atmosphere presses on every square inch with a weight of 15 pounds.

There are FORTY COUNTIES *in* ENGLAND, *with* PRINCIPAL TOWNS, *as under.*

BEDFORD—Bedford.
BERKSHIRE—Reading, Windsor.
BUCKINGHAMSHIRE—Buckingham, Aylesbury.
CAMBRIDGESHIRE—Cambridge, Newmarket, Ely.
CHESHIRE—Chester, Stockport.
CORNWALL—Launceston, Truro, Penzance, Falmouth.
CUMBERLAND—Carlisle, Whitehaven.
DERBYSHIRE—Derby.
DEVONSHIRE—Exeter, Plymouth, Devonport.
DORSETSHIRE—Dorchester, Sherborne, Poole.
DURHAM—Durham, Sunderland, South Shields.
ESSEX—Chelmsford, Colchester, Harwich.
GLOUCESTERSHIRE—Gloucester, Bristol, Cheltenham, Tewkesbury, Stroud.
HEREFORDSHIRE—Hereford, Ross.
HERTFORDSHIRE—Hertford, Ware, Watford, St. Albans.
HUNTINGDONSHIRE—Huntingdon.
KENT—Canterbury, Chatham, Rochester, Dover, Gravesend, Maidstone, Margate, Ramsgate, Hythe, Folkestone, Dartford, Woolwich.
LANCASHIRE—Lancaster, Manchester, Liverpool, Bolton, Bury, Blackburn, Warrington, Preston.
LEICESTERSHIRE — Leicester, Loughborough, Harborough, Hinckley.
LINCOLNSHIRE—Lincoln, Stamford, Boston.

MIDDLESEX—London, Brentford.
MONMOUTHSHIRE— Monmouth, Abergavenny, Newport, Chepstow.
NORFOLK—Norwich, Lynn, Yarmouth, Thetford.
NORTHAMPTONSHIRE—Northampton, Wellingborough, Kettering, Peterborough, Daventry.
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MULTIPLICATION TABLE.

Twice		
1	are	2
2	..	4
3	..	6
4	..	8
5	..	10
6	..	12
7	..	14
8	..	16
9	..	18
10	..	20
11	..	22
12	..	24

3 times		
3	are	9
4	..	12
5	..	15
6	..	18
7	..	21
8	..	24
9	..	27
10	..	30
11	..	33
12	..	36

4 times		
4	are	16
5	..	20
6	..	24
7	..	28
8	..	32
9	..	36
10	..	40
11	..	44
12	..	48

5 times		
5	are	25
6	..	30
7	..	35
8	..	40
9	..	45
10	..	50
11	..	55
12	..	60

6 times		
6	are	36
7	..	42
8	..	48
9	..	54
10	..	60
11	..	66
12	..	72

7 times		
7	are	49
8	..	56
9	..	63
10	..	70
11	..	77
12	..	84

8 times		
8	are	64
9	..	72
10	..	80
11	..	88
12	..	96

9 times		
9	are	81
10	..	90
11	..	99
12	..	108

10 times		
10	are	100
11	..	110
12	..	120

11 times		
11	are	121
12	..	132

12 times		
12	are	144

PENCE TABLE.

20	pence are	1*s.*	8*d.*
30	....	2	6
40	....	3	4
50	....	4	2
60	....	5	0
70	....	5	10

80	pence are	6*s.*	8*d.*
90	....	7	6
100	....	8	4
120	....	10	0
240	..	a Sovereign	
365	..	£1	10 5

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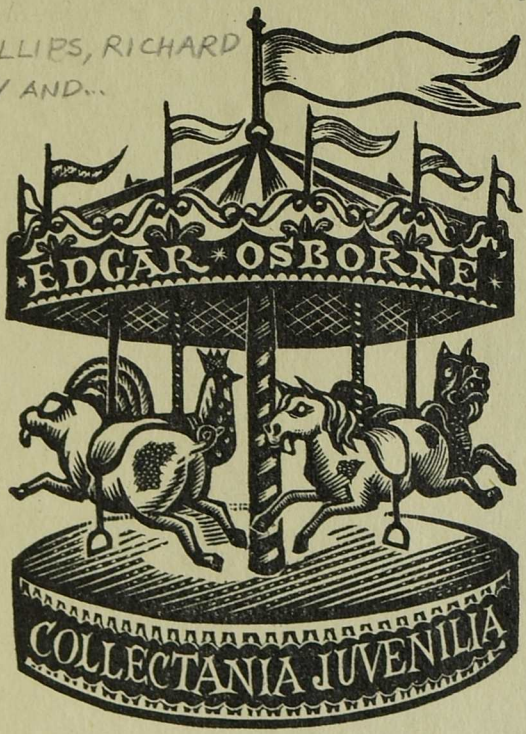

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