

pleasantly dissipates. Landlords should be burlly, and landladies buxom, when they drink so much and do so little; the wit of the waiters is chiefly shown in avoiding untipped labor; the chamber-maids would be prettier if they did their work better. But, as I have already said, the English people seem to like their hotel system as it is, and any attempt to practically reform it meets with strenuous opposition and bitter prejudice. However, the world moves, and even England can not stand quite still.

JACK AND HIS MOTHER.

"DEAR help us!" cried Jack's mother, dropping her smoothing-iron and looking at Jack with horror and disgust, "I have always tried to bear and believe with decent resignation that I am made of dust. But to be told that I am made of starch and sugar, lime and phosphorus, and that I, a respectable woman, go about with eight or nine pails of water in my composition, is a little too much. I suppose you will say next that I am first cousin to the lime-bucket and the match-box."

"Don't know about that," retorted Jack, "but you are a member of a small family that begins with the sun and ends with the rhizopods, interesting jellies, who eat without a mouth and digest without a stomach. And, considered individually, you may be said to be a sort of stove. The oils and starch of plants keep up the fire in your blood, but coal would answer quite as well if it could be dissolved in the liquids of the body. It is likely that a way of preparing it will be discovered some day, and then we shall see men and women eating their bushel or peck of coal for lunch when they can get nothing better."

Jack's mother shuddered.

"Talking of coals," persisted Jack, "do you know what heat is?"

"Of course I do," she said, somewhat scornfully. "It is fire."

"But if you rub two pieces of iron together by the help of water-power," answered Jack, "you can heat a large room as well as a stove could do it. And if you rub them together in a box surrounded by water, by the help of horse-power, you can make the water boil. Steel bars are welded together by powerful blows of a hammer, because further application of fire would spoil the quality of the steel; and under the blows of this hammer the bars get red-hot; or make a hole in a thick block of wood with a gimlet, and the gimlet will get so hot that it will almost burn your cheeks. Here is plenty of heat, you see, and no fire at all."

"I remember; I have read about it," said his mother, picking up her iron. "Heat is a fluid called caloric, and all this rubbing and pounding squeezes it out, I suppose."

"If that is the case," replied Jack, "after we had rubbed our pieces of iron together a great while the caloric would begin to run low, and the heat would grow less and less, till by-

and-by there was none. But you can rub your iron as long as you like and it will always give out as much heat as it did in the beginning. Now how do you explain that?"

Jack's mother looked puzzled.

"Here is another thing," pursued Jack, with warmth. "Say we are rubbing the pieces of iron together by the help of water falling on the wheel. A mechanic could measure and find in round numbers just how much force there was at the wheel; and philosophers have measured heat also. One degree of heat always will raise one pound just so many feet. Eleven hundred and twenty, I believe. Now, then, the force turns the wheel and is gone. You can never find it any more; but you know how much it was in numbers. Now gather up all your new heat and measure that. One always equals the other. Just so much force or motion as you had, just so much heat you have got always."

"I don't see any thing in that," returned his mother.

"But look here," insisted Jack. "You know how stiff and hard iron is. All its particles are held tight by what we call attraction of cohesion. Now, heat your iron. What does it do? It expands. Its particles pull so hard to get away from each other that the iron grows larger. Don't you see, then, that what heat really gives iron, or any other substance, is motion?"

"You mean to say, then, that this fire in the range is motion?"

"Certainly I do. The liveliest kind."

"Don't believe it."

"But I will prove it to you. When you filled that tea-kettle with cold water the water was still, was it not?"

"Why, of course it was."

"And as it began to grow warmer it began to move, did it not? And the hotter it grew the more it bounced and bubbled and swelled, till it fairly shook the kettle lid; and at last, as you would say, it grew so hot, or, as I should say, it got into such furious motion, that the particles of water actually succeeded in tearing themselves apart and flying off in tiny atoms of steam. Now if the heat in that water is not motion, what is it?"

Jack's mother made no answer—perhaps because she was obliged just then to look after the peas and asparagus.

"There is another thing," remarked the relentless Jack. "What do you think your dinner really is?"

"Why lamb, peas, and asparagus, to be sure."

"That is what it is just now; but it is a chemical combination, made out of oxygen, hydrogen, carbon, nitrogen, and ammonia."

"I believe you want to turn me sick," remarked his mother, who was really pale.

"I do not see why it should. Your stomach, all our stomachs, are chemical laboratories in miniature, you know."

"Now, Jack, if there is a thing I despise it

is chemistry. I always do think of smells and blue fingers."

"But it is a beautiful process," continued Jack. "A ray of light leaves the sun and travels over one hundred and ninety thousand miles a second. Whenever light strikes against a solid body, like force, it disappears. But examine the solid body and you will find heat, setting its particles in motion. Now at the time that the story of our dinner commences there were, of course, many seeds in the earth—say the seed of the peas, and of the grass that the lamb fed on. The ray of light enters the germ and becomes heat. The germ is the master-builder; the seed is the store-house; the heat is the workman—a little working chemist, in fact. In the seed store-house is something like insoluble starch and a sort of ferment, which the heat unites and makes into sugar; and uniting this with albumen and oils, also in the store-house, begins to build the plant, which soon sets up for itself as a chemist. It gets the oxygen, hydrogen, etc., from the air, and from the moisture that heat has drawn up from the ocean and the rivers into clouds, and sent down again on earth in fogs, dews, rains, and vapors. Out of these it and heat make albumen, sugar, oils, and starch, most of which is stored away for us, or else is eaten by our friend the lamb, and prepared by him for your use—in fact he is a sort of preserve of those substances which he can digest at first hand, or first stomach, better than you."

"Wonder how you know so much about it," remarked his mother.

"Lamb, peas, etc.," continued Jack, calmly, "are ground and sifted in the stomach's mill. The albumen is taken to build you up again: I mean the tissues of your body. The oils and starch are just so much coal. They are dissolved, and resolved, and heaven knows what all, till they reach the lungs, where they join with the oxygen that you breathe from the air, and burn like that fire," pointing to the range. "So you see my bill of fare was correct. Oxygen, hydrogen—"

"Now, Jack, will you stop?"

"And as there must be some latent heat also, I suppose I may add that we had a bit of the sun for dinner."

"Jack, I call it wicked to talk like that."

"Wicked! I call it grand! sublime! Just see how simple and beautiful it looks beside the clumsy old theories about squeezing out heat, and force being lost and destroyed every time that it is used. We know that God gave the sun his heat, though we can not tell how it is made. This heat leaves the sun as light. It enters the air as heat and gives it motion. The heated air grows larger and lighter and rises; the cold air drops down in its place, and so we have the trade-winds. Light enters the water as heat. The heat gives it motion, something as it does in your tea-kettle. The water atoms are pulled apart, grow light, and rise in vapor, which soon huddles together in clouds and falls

again in rain, which feeds the streams that drive our mills. Heat stores in plants the nourishment of animals and men. This nourishment gives out heat, which becomes force till we use it, when it once more turns to heat, or, perhaps, into another form of motion that we call sound."

"Is the boy crazy?" inquired his mother, apparently of the tall candlesticks on the shelf.

"Not at all," returned Jack, quietly. "Sound is motion, as you could easily prove for yourself. Make a rod (fastened at one end, and with a bright bead at the free end) vibrate, so that its shadow shall fall on a white screen. Each vibration, as it sings its little note, will make ripples and indentations on the screen. The faster the vibrations the shriller the note it will sing, and the deeper will be the curves and ripples. Scatter sand over a metal plate, and draw a violin bow across the edge of the plate, and the sand will fall into the most beautiful figures; and the higher the note the more complicated the figures. Each note has its own particular markings; its picture, so to speak, which proves that sound is motion, and music is a regular, even motion."

"Well," said Jack's mother, drawing a long breath, "I am glad there are some everyday things left that haven't any histories or any explanations, and that nobody can make out any different from what they used to be."

"Sure of that, mother?" asked Jack, roguishly. "What things, for instance?"

"Well," replied his mother, deliberately looking about the room. "Well, there is the clock. That is old-fashioned enough, and there is nothing to say about that. It goes, and that is all you can say about it."

"I can say one thing more," retorted Jack. "It is a round-faced old hypocrite, to keep up such a ticking and creaking when all the time it is running on your force."

"My force!"

"Certainly. It ticks the whole eight days on the strength of your arm, that you put into it when you wound it up, and the only reason it is so long in using up its borrowed capital is the resistance of the air to the pendulum, and the friction of the machinery. You need not look so unbelieving, mother. You have been doing your own time-keeping for the last twenty years, for all you keep a clock."

"Well I never!" murmured his mother. "If I had known that I had that responsibility, added to all my other cares, I really believe I should have sunk under it."

"Why that is nothing to the other wonderful results that you are all the time accomplishing. When you speak you literally cut and carve the air into waves. And as these waves roll on outward, long after we have done hearing them, you may be said to alter the whole air. And when you lift up the clothes-line, or tilt Maggie's see-saw, 'you have altered the earth's centre of gravity and sent a shock through the whole planetary system.' Now, traveling for-

ty miles an hour, it would require more than two hundred and seventy years to get to the sun; so I call that having an extended influence," concluded Jack, roguishly.

His mother bridled.

"This is very entertaining. Pray go on, Sir. Is there any thing new about—about—my ears, we will say?"

"I don't know if there is any thing new to you, but there is something very curious in the human ear," answered Jack. "Beside the drum of the ear, and the curious little bones behind it, there is a labyrinth filled with water, exceedingly minute bristles, and a little musical instrument with three thousand strings stretched tight, like those of any other lute or harp; all of which are thrown into vibration when a sound shakes the drum of the ear."

Jack's mother opened her eyes to their widest extent.

"Three thousand strings! and a chemical laboratory in my stomach; a stove in my lungs; a force-pump in my heart; all my atoms moving and expanding when I get warm, and that is twenty times a day! Why I feel more like a jelly than a woman—just to think of it! though I don't believe it. You went a little too far when you set me at disturbing the earth's centre of gravity! But I do believe you could tell a history about any thing. Couldn't you now? Here are my scissors. Can you say any thing about them?"

"There is a tragedy in every such pair of scissors," answered Jack, instantly. "To give those scissors that half-round shape hundreds of men are laying down their lives every year."

"What do you mean?"

"Just this. To grind scissors like that, or razors, or steel forks, they must be ground on a dry grindstone, hung in a frame on which the grinder sits. As he holds the steel and the stone turns, his mouth and nose are filled with the dust of stone and steel, and his eyes with the sparks. His lungs are filled with the stone and steel dust, by which they are constantly irritated, till after death the lung looks as if it had been dipped in ink; and these men live, on the average—fork-grinders, twenty-nine years; razors, thirty-one years; scissors, thirty-two years, and so on. The more water used on the stone the longer the life."

"Dear me!" murmured Jack's mother, astonished and sympathizing.

"There is more tragedy in the box of lucifer matches," pursued Jack, pointing toward them. "They are dipped in phosphorus, and the dipper, who inhales it, is apt to acquire a disease of the jaw, in which finally the bone dies and comes away; while the silverer of our looking-glasses is equally unfortunate. Sooner or later his system is filled with the poison of the mercury. He loses all control over his muscles, his teeth drop out, he grows brown and shriveled—"

"Dear me!" interrupted his mother, more energetically than before. "I am sure I will never buy another glass! At least I would not,

only what would be the use? Somebody else would, you know! I am glad we have no such horrid things near home."

"We have some horrid things near home," answered Jack, fixing his eyes on a package which she took out for a moment from the closet, and which sent out a familiar aromatic odor.

"What do you mean by that, and by looking at the coffee so? It has chiccory in it, we all know; but there is nothing bad about that."

"Nothing bad! Do you know what chiccory is made of? Here is a list of articles—and a very pretty list it is: Roasted wheat, ground acorns, finely sifted coal ashes, red earth, baked horses' and bullocks' livers, mahogany and walnut saw-dust, ground horse-leathers."

"Jack, if you are not telling me the truth—" said his mother, turning pale and tossing the package of "pure ground coffee" on one side with a look of horror.

"I have every reason to believe what I say is true," returned Jack, earnestly; "and the case of chiccory is no worse than that of tea. In green tea there is Prussian blue, old tea leaves, leaves of trees dried, and coppers. In black tea, gum, black-lead, used tea leaves, etc., etc. In sugar—"

"Now, Jack, you do not mean that you are going to say a word about the sugar?"

"I am going to say that brown sugar swarms with the sugar insect, and is helped with wheat flour; and loaf-sugar is sometimes prepared with sulphuric acid, old paper, and rags. That is all."

"All!"

"And I do not know that it is worse than red pepper, which is adulterated with brick-dust, salt, deal saw-dust, red-lead, and other agreeable compounds."

"Who found it out?" demanded his mother, suddenly.

"The microscope."

"More of your modern science! It strikes me people were more comfortable when they knew a little less."

"Why, mother, that is—"

"See here, Jack," she interrupted, peremptorily; "not another word. I shall never be the woman I was. I have found out that I am a stove, and want oxygen to burn. Now how much draught shall I get in the meeting-house, and in the neighbors' parlors, shut up tight and dark! And how can I attend to the sermon, and make neighborly calls, when I shall all the time be worrying about my draught? And my Maggie is a stove too! Where is her draught when she is at school? About as much she will get as a stove set to draw with fifty others in one little chimney. There is the albumen too, and the starch, and the oils! How are we to get the juices of plants and animals if we have meat cooked as hard as leather, and vegetables kept on a furious boil till they are hard? And that is what we get in the most of houses. Why just think of your Aunt Etheridge! I used to go there, and think what hot, dark rooms! What cross, thin, flabby women, sit-

ting around that hot stove! But now when I go there I shall be weighing in my mind how many pounds of poison they are taking in to burn and send all over their bodies; thinking how their fires must smoulder and burn low and blue; stifling for a draught; aching to pull up the curtains; making myself regularly nervous with wondering how their chemistry is to be done."

"Nonsense, mother," said Jack.

"No, it is not nonsense," insisted the agrieved lady. "I shall never look at that clock that I shall not think how I am obliged to do all my own time-keeping for the rest of my life. Building a fire too! It used to be as easy as winking; but to rub a match till its atoms are in such violent motion that—"

Here Jack burst into a fit of laughter that drowned the rest of his mother's sentence. She stood regarding him in sorrow and wrath.

"For tea, and sugar, and pepper, my comfort in them is gone," she said, solemnly; "and for the sewing society, I dread it; I shall not be able to hear a word for thinking of the horrid look of the air over their heads, when they all talk together. And I am not surprised that a little knowledge is a dangerous thing! Dinner is ready. What a mercy they have not found out how to adulterate roast lamb!"

THE DRY TORTUGAS.

I.—THE KEYS AND THE FORT.

ALONG the twenty-fourth parallel of north latitude, near to the tropical line, and extending westward into the Gulf of Mexico about one hundred miles from the southern extremity of Florida, are numerous mound-like ridges of white sand, that have, through influence of tide and wind, been dumped above the waters of the Gulf from that vast bed of debris known as the Florida Reef. On the extreme western portion of the reef is the group anciently called, and Spanishly, Tortugas; familiarly denominated Tugases by the wreckers, and latterly known to the world as "The Dry Tortugas."

These islands derive their appellative, "Key," through several corruptions from the Spanish *Cayo*, an "islet," and the specific title *Tortuga*—"tortoise"—from the huge sea turtles that yet frequent them. "Dry" they were called in contradistinction to the vast tract of *wet* reef which at low-water nearly reaches the surface.

If you were to approach the Dry Tortugas, bound in from the north, the "Keys" of the Florida Reef would be in sight on your right, or starboard quarter; the pale, whitish blue of the sea reveals the coral bottom of the reef which you are just clearing to avoid the current of the Gulf Stream, whose deep blue waters are on the opposite side. On the western horizon a solitary tower rises into elegant proportion, looking more like a monument than the usual form of a light-house, so much of architectural beauty it has; and this is Loggerhead Light. Soon the lesser tower of Garden Key Light and

the battlements and bastion towers of Fort Jefferson appear. How much this all looks like some fairy scene, some floating castle! and then, if it is evening, and the sun has just gone down, what a glorious picture you have! a tropical sunset; radiant with grandeur over the whole arch of the heavens; effulgent with all the glory of color; a fitting back-ground for the noble art-forms of this great fortress in the sea.

Little white islands crowned with mangrove and cedars now appear surrounding, ring-like, the central harbor. Between these islets a belt of shoals or reef, whereon the surf breaks violently, presents at three different points openings to the narrow, winding channels which lead to the impregnable structure within.

While we are waiting the ceremonies of the officer who must visit the vessel before she is allowed to enter, we will add a word of history.

In 1819 the King of Spain sold Florida to the United States for five millions of dollars. After a time our Government considered that the Tortugas should be fortified, that such a strong-hold should not be left for other nations to occupy in time of war. So, about the year 1847, Fort Jefferson was commenced on Garden Key, an island of thirteen acres, standing centrally in the group, and surrounded by a deep channel or harbor. Here was an old-fashioned light-house; and here, sixty miles from human habitation, lived the keeper; his home a Swiss-like structure with a broad veranda, before which stood two old cocoa-nut palms, whose wonderfully large leaves gave grateful shade, and whose fruit furnished cool, delicious beverage and meat. This old cottage, which was lately removed, is made the scene of one of Cooper's novels—"Jack Tier."

Relics of the Buccaneers are occasionally found upon the reef; long guns of iron and brass, one of which is preserved at Fort Jefferson. The Keys of Florida and the neighboring West India Islands were long the resort of freebooters. French, English, and Dutch were among them; and it is said that they were held together by all the force of martial law. It is not many years since the remnant of this piratical band were hunted away by the vessels of our West India squadron. Spanish coin has been found on the Keys. Captain Benner, the light-keeper at Tortugas, recovered something over a thousand dollars of silver money at East Key.

Once in the central harbor of Tortugas it is easy to see why it will be a work of extraordinary strength, and consequently one of great importance to the country. Fort Jefferson, the citadel, will be surrounded by a continuous line of fortifications and heavy batteries, covering an area of eight or nine miles in diameter; guarding closely the three narrow and extremely labyrinthian channels of approach.

Fort Jefferson is an imposing structure. As we see it from the harbor two long faces or "curtains" are visible, each pierced and ar-