

"that if any kind of wood is just half as heavy as water, then it will have to sink down until it is just one-half under water; for then it will have displaced just water enough to be equal to it in weight. If it is very light, like cork, then it will not sink down so far: my book said that cork was about a quarter as heavy as water; and so, when it floats, one quarter of it would be under water and three quarters above."

"Suppose anything just exactly as heavy as water," said Rollo.

"Then," said Jonas, "It would sink until the top of it was just level with the surface of the water."

"Is there anything just as heavy as the water?" asked Rollo.

"Yes," replied Jonas, "you are."

"I am?" said Rollo.

"Yes," replied Jonas; "that is, your body is very nearly as heavy as a mass of water of the same bulk."

"Then, if I was to get into the water, I should sink in, just level with the top of the water."

"Yes," said Jonas, "very nearly."

"Then it is not exact," said Rollo; "would it be a little more or a little less?"

"Why, it would depend upon the state of your breath," said Jonas; "sometimes a little more, and sometimes a little less."

"Why, Jonas?" said Rollo, "how can that be?"

"If you draw a long full breath," said Jonas, "so," (and here Jonas paused a moment, and stood still in the road, and made a long and full inspiration, that is, drawing in of the breath;) "if you do so the air goes into your lungs, and swells out your chest, and makes you larger and lighter. But if you breathe out as much of the air as you can," (and here Jonas gasped again, and made a long expiration,) "then," he added, resuming his breath again, "the lungs are exhausted, the chest shrinks, and the body becomes heavier."

"I shouldn't think that would make much difference," said Rollo.

"Yes," said Jonas, "it makes a great deal of difference. When a boy is in the water, if he draws in as much breath as he can into his lungs, he floats. If he breathes out all the air he can, he sinks."

"Did you ever try it?" said Rollo.

"Yes," said Jonas, "very often, when I have been in the water."

"Then the body itself," said Rollo, "is just about as heavy as water."

"Yes," said Jonas, "I believe it is—just about."

"And then," added Rollo, "it will sink just even with the water."

"Yes," said Jonas, "it must sink until it takes the place of its own weight of water; and its own weight of water would be just as big as it is itself. So it must sink until it is just all in."

"That's the principle then, is it?" said Rollo.

"Yes," said Jonas, "that's the principle."

"I don't see," said Rollo, "how you can tell by it whether a tub would bear me up or not."

"Why, it shows how much the tub must sink, if you get into it," said Jonas.

"How?" asked Rollo.

"Why, the tub must sink just as much deeper than it did before you got into it, as to be equal to the size of your body. Because, you see, that whether you are in a tub or out of it, in order to be buoyed up in the water, you must take the place of as much water as will weigh just as much as you do yourself; and as water is just about as heavy as your body is, you must take the place of a quantity of water just as big in bulk. Now, don't you think a tub is bigger than you are?"

"Yes," said Rollo, "it is bigger round, but then it is not so high."

"No," said Jonas, "it is not so high, and it is very different in shape; but, making allowance for the difference of shape, don't you think that, on the whole, it is a great deal bigger than you are?"

"That is," continued Jonas, "suppose I set was a wax figure, just as big as you are, and this wax figure was to be melted down, and the wax poured into the tub, do you think it would fill it full?"

"No," said Rollo, "I don't think it would."

"I'm sure it would not," said Jonas, "Now, if your body would fill the tub half full, if put into it compactly, then it would sink the tub half down into the water. If you were equal in size

to two thirds the tub full, then the tub would sink two thirds its depth into the water."

"And it is just so with a boat, I suppose," said Rollo.

"Yes," said Jonas; "when a man steps into a boat, he sinks it into the water, just enough more than it was before to be equal to the size of his own body. Of course, if it is a large boat, it would not have to sink so far as if it was small."

"And if it was a great ship, it would not sink any."

"Yes it would," said Jonas.

"No, it would not," said Rollo, "I know."

"How do you know?" asked Jonas.

"Why, once I went into a ship, and it did not move at all when I stepped on it."

"How did you know?" said Jonas.

"Why, I should have felt it sinking under me a little, if it had sunk any."

"Suppose that another boy had gone aboard the ship just after you did: would it have sunk any under him?"

"No," said Rollo. "There was another boy, James, and it did not sink at all."

"Suppose there had been fifty or one hundred boys," said Jonas.

"O, if there were a great many," said Rollo, "I suppose that after a while the ship would begin to sink."

"Then you think that some boys might go aboard a ship, without making it settle any in the water, but that other boys would make it settle."

"No," said Rollo, "I do not mean that some would make it settle, and others would not; but that, when there were a great many, all together would make it settle."

"Yes; but," said Jonas, "they would not all go aboard together. I mean to suppose that they come one after another; and, of course, if it does not settle any at first, but afterwards does settle, there must be some one boy, whose coming aboard first makes it sink deeper in the water."

Rollo did not answer. He did not know exactly what to say to Jonas's reasoning.

"Now," said Jonas, "it is very clear that, if a thousand boys coming aboard a ship, would make it settle at all deeper into the water, then one boy must make it settle one thousandth part as much."

"Well," said Rollo, "if you do make it out so in reasoning, I know it is not so, for I have tried it."

"You are a very fine philosopher," said Jonas; and he began playfully to punch Rollo with the butt of his whip handle.

"You believe your senses rather than your reason! A fine philosopher you!"

AGRICULTURE.

Disintegration of Soils.

The interesting experiments of Struve have proved that water impregnated with carbonic acid decomposes rocks which contain alkalies, and then dissolves a part of the alkaline carbonates. It is evident that plants also, by producing carbonic acid during their decay, and by means of the acids which exude from their roots in the living state, contribute no less powerfully to destroy the coherence of rocks. Next to the action of air, water, and change of temperature, plants themselves are the most powerful agents in effecting the disintegration of rocks.

Air, water, and the change of temperature prepare the different species of rocks for yielding to plants the alkalies which they contain. A soil which has been exposed for centuries to all the influences which affect the disintegration of rocks, but from which the alkalies have not been removed, will be able to afford the means of nourishment to those vegetables which require alkalies for its growth during many years; but it must gradually become exhausted unless these alkalies which have been removed are again replaced; a period, therefore, will arrive when it will be necessary to expose it from time to time to a further disintegration, in order to obtain a new supply of soluble alkalies. For small as is the quantity of alkali which plants require, it is nevertheless quite indispensable for their perfect development. But when one or more years have elapsed without any alkalies having been extracted from the soil, a new harvest may be expected.

The first colonists of Virginia found a country the soil of which was similar to that mentioned above; harvests of wheat and to-