

the local water reservoir into which our wells dip is about 80 feet below the surface. My gardener tells me that the tree has been "bleeding" at about the same rate for fourteen of the fifteen days, the first day the branch becoming only somewhat damp. During the earlier part of that time we had frosts at night and sunshine but with extremely cold winds during the days. At one time the exuding sap gave, I am told by two different observers, icicles a foot long. A much warmer, almost summer temperature has prevailed during the past three days and no wind. This morning the temperature of the sap as it escaped was constant at 52° F., while that of the surrounding air was varying considerably.

The collected sap was a clear, bright water-like fluid. After a pint had stood aside for twelve hours there was the merest trace of a sediment at the bottom of the vessel. The microscope showed this to consist of parenchymatous cells, with here and there a group of the wheel like or radiating cells [?] which botanists, I think, term sphere-crystals. The sap was slightly heavier than water, in the proportion of 1005 to 1000. It had a faintly sweet taste and a very slight aromatic odour.

Chemical analysis showed that this sap consisted of 99 parts of pure water with 1 part of dissolved solid matter. Eleven-twelfths of the latter was sugar.

That the Birch readily yields its sap when the wood is wounded is well known. Philips quoted by Sowerby, says:—

"Even afflictive Birch
Curs'd by unlettered youth, distills
A limpid current from her wounded bark,
Profuse of nursing sap."

And that Birch contains sugar is known, the peasants of many countries, especially Russia, being well acquainted with the art of making Birch wine by fermenting its saccharine juice.

But I find no hourly or daily record of the amount of sugar-bearing sap which can be drawn from the Birch, or of any sap from any tree, before it has acquired its great digesting or rather developing and transpiring apparatus—its leaf system. And I do not know of any extended chemical analysis of sap either of the Birch or other tree.

Besides sugar, which occurs in this sap to the extent of 616 grains, nearly 1½ oz., per gallon, there are present a mere trace of mucilage, no starch, no tannin, 3½ grains per gallon of ammonical salts yielding 10 per cent. of nitrogen, a distinct trace of nitrates, 7.4 grains of nitrates containing 17 per cent. of nitrogen, no chlorides, or the merest trace, no sulphates, no sodium salts, a little of potassium salts, much phosphate and organic salts of calcium, and some similar magnesian compounds. These calcareous and

magnesian substances yield an ash when the sap is evaporated to dryness and the sugar and other organic matter burnt away, the amount of this residual mineral matter being exactly 50 grains per gallon. The sap contained no peroxide of hydrogen. It was faintly if at all acid. It held in solution a ferment capable of converting starch into sugar. Exposed to the air it soon swarmed with bacteria, its sugar being changed to alcohol.

A teaspoonful or two of, say Apple juice, and a tablespoonful of sugar put into a gallon of such rather hard well-water as we have in our chalky district, would very fairly represent this specimen of the sap of the Silver Birch. Indeed, in the phraseology of a water-analyst, I may say that the sap itself has twenty-five degrees of total, permanent hardness.

How long the tree would continue to yield such a flow of sap I cannot say. Probably until the store of sugar it manufactured last summer to feed its young buds this spring was exhausted. Even within twenty-four hours the sugar has slightly diminished in proportion in the fluid.

As a chemist and physicist myself, knowing something about capillary attraction, exosmose, endosmose, atmospheric pressure and gravitation generally, and the movements caused by chemical attraction, I am afraid I must concur in the opinion that we do not yet know the real ultimate cause or causes of the rise of sap in plants. *Ashlands, Watford, Herts, April 4.—Gardeners' Chronicle.*

THE UNEARNED INCREMENT.

[The following interesting letter from the Duke of Argyll appeared in the *Times*.]

The "unearned increment" which may arise in the price of an article, or of any possession, can only mean such increase of that value as may be brought about apart from any direct exertion on the part of its owner or possessor. Now, as the value of every article is always due to two elements—supply and demand—of which the owner's or producer's exertions can never be more than one, it is clear that every increase in the value of every conceivable possession must, in this sense, and in this measure, be "unearned."

To those who follow up this consideration it will be at once apparent that the phrase "unearned increment" is honey-combed with fallacies, and represents nothing more than a vague, ill-digested conception of the unquestionable fact that the productions and possessions of men sometimes receive great and sudden enhancements of value from causes to which they themselves did not contribute—from the exertions of other-, or from the general progress of society.

This is quite true. But it is not true that this fact applies exclusively, or even

specially to any one class. It is a fact which applies generally, if not universally, to all ranks and conditions of men. To no class does this fact apply more conspicuously than to the class which lives by the wages of labour. Great and sudden rises in the value of labour are almost always due to causes independent of the workman. The suggestiveness of the mind of one man, the enterprise of another, the capital of a third, each or all of these are continually opening new branches of industry, creating new demands for labour, and giving to wages sudden, and often enormous, increments of value.

It is needless to say that all men—and there are thousands—who make fortunes in the share market or in other investments of capital, are men who gain entirely by changes in value which they do not produce, and to which they do not even contribute. In commerce, again, men live on increments of value which they may foresee, but which they never cause; and very often enormous fortunes are made by enhancements of price which those who profit by them have neither foreseen nor produced.

The same principle applies to manufactures, which are, of course, only a separate branch of commerce. But there are some kinds of success in manufacturing industry to which, I admit, this principle hardly applies at all. There are cases in which men of original and inventive genius have given some new mechanical embodiment to mind, and, to use the expression of Lord Bacon, have "endowed the human family with new mercies." Such is the success of my distinguished friend, Mr. James Nasmyth, whose most interesting and instructive life has just been published. There are others, not less distinguished, who are still in the full career of their activity, and whose names will occur to all. It can hardly be said that any possible enhancement in the price of their productions can be "unearned" by them. The world may always be said to owe them far more than it can ever give. These are the kings and magnates of the industrial world. They constitute, of necessity, a small class; and, of the thousand others who have made money in manufactures, one thing only is certain about them, and that is, that they do not belong to it.

For behind this small class—*longo intervallo*—comes the great mass of those who are engaged in manufacturing pursuits, with every degree in the scale of proportion between intellectual merits and material results, from those who by patient industry have built up a just reputation for some special honesty in material, or some special honesty in work, to those who, by what may be called in comparison, the mere mechanical weight of capital, have extinguished minor industries