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AMERICAN FRUIT IN FOREIGN MARKETS.

Hitherto, for the most part, the least profitable seasons for fruit-growers have been those of most abundant crops. Not unfrequently the waste of fruit for lack of means for getting it to market, or to markets not already over-stocked, has amounted to millions of dollars' worth in a single season; a recent and intelligent estimate puts the loss for such seasons as high as $15,000,000.

Thanks, however, to the ingenuity of our inventors, American fruit-growers no longer need to see the best fruits of their labors, the most bountiful gifts of Nature, made practically valueless by local plethora, while half the world is longing for a taste and willing to pay a good price for the unattainable luxury. Rapid transit, refrigerating ships and cars, and other means of forwarding fresh fruits to great distances have widened enormously the market for such products; while contrivances for drying, preserving, canning, and so on have lately been so multiplied and improved as to make it possible not only to prevent wholesale waste of fruit, but to secure for distant or future use the whole crop of the most abundant years. As a natural consequence, fruit raising promises to furnish from year to year a wider and more regular source of profit; and every year's inventions will help to make the industry more and more remunerative and sure.

The home market for fruit, fresh and canned, is already co-extensive with the whole country, and the fruit season lasts the entire year; the foreign market widens almost as rapidly. The following figures, from an extended review of the condition and prospects of the export trade, printed in the *Tribune*, shows the progress made during the past sixteen years, the years severally ending July 1st.

1861	$ 269,000	1870	$ 542,000
1862	238,000	1871	509,000
1863	364,000	1872	804,000
1864	865,000	1873	1,703,000
1865	1,001,000	1874	990,000
1866	492,000	1875	1,633,000
1867	380,000	1876	827,000
1868	406,000	1877 (11 mos.)	2,831,000
1869	306,000		

This for the exportation of fruit to Europe. Considerable quantities go also to Australia, South America, and the West Indies. The large figures for 1865 are owing, in part, to the exportation of fresh apples, which was then begun on a considerable scale; the business being fairly established in 1873. Since October, 1876, the shipments to England—mostly baldwins, greenings, russets, and Newtown pippins—have amounted to nearly four hundred thousand barrels, always at remunerative prices. Circulars recently issued from Liverpool state that as a result of the season's trade a preference for American apples has been established in England, and that hereafter, whether the English crop is large or small, large supplies of well selected American fruit are likely to find a good market there. The capacity of the English market for fresh peaches and pears has not yet been tested. There is reason to believe, however, that it will be limited solely by the capacity of our refrigerative ships to land supplies in good condition. The foreign market for canned peaches is almost unlimited, upwards of seven hundred thousand dollars worth having found a lively demand abroad during the first ten months of the season of 1876–7. And dealers are unanimous that, for the present, peach-growers will do better to can their surplus crop rather than dry it. The foreign market for dried peaches has yet to be tested. If the recently invented evaporators prove capable of drying large quantities cheaply and well, the demand for dried peaches abroad may be indefinitely increased. At present the price is too high to tempt the working classes to buy, and they are our principal customers for dried fruit, particularly those of Germany. The poor people of England and Russia buy to a limited extent; France is also a buyer, but whether for domestic use or for distillation is not positively known. The miners of Australia are also large buyers, but there is not much reason to count largely on a permanent market there. Fruit growing is increasing rapidly in Australia, and before many years the colonies in that quarter of the world must be able to supply at home the home demand. The demand for dried apples in Europe and Australia is now very great, so long as the price does not exceed seven cents a pound; at five cents the market is practically unlimited. Last year something like fourteen million pounds were exported. Curiously sliced apples, though really better than the quartered, will not sell at all abroad. Foreign buyers want them cut in pieces as large as possible, the larger the better. The manner of packing is also important. For the European market the packages must not be smaller than barrels, and hogsheads are preferred. Australia, on the contrary, will not have packages as large as barrels. For that market the apples must be put up in 55 lb. and 100 lb. kegs, suitable for transportation to the interior on the backs of mules. Venezuela also demands small packages.

INDIGESTIBLE MEDICINES.

It is not an uncommon blunder for young or ignorant physicians to write prescriptions, the ingredients of which chemically reacting upon each other produce substances wholly different in nature and physiological effect to those intended to be administered. Not long ago we noted an instance of how two harmless drugs when combined formed a highly poisonous mixture, and it may so happen that innocent mendicaments may unite to produce a compound dangerously explosive. For the knowledge that still another danger lurks in the apothecary's vial we are indebted to Dr. J. W. Compton, of Evansville, Indiana, who has called the attention of physicians to the frequent indigestibility of their curative potions. If medicines are not dissolved in the digestive fluids of the stomach and intestines they can never be absorbed: if not absorbed they can never enter the circulation and hence cannot produce the results intended. There are various diseases which affect these fluids. Thus, they may be carried off by hœmorrhage and sweats, in some maladies the saliva may be withheld, in others the gastric juice becomes deprived of its solvent principles or may be arrested, liver ailments may withhold the alkaline bile, and so on; so that the medicine, especially if solid, instead of producing the slightest good, acts merely as an irritant and foreign substance, and occasions at best loss of valuable time. Dr. Comstock gives several striking instances of invalids rejecting medicines in an unaltered state, the drugs being in all instances given in the form of pills, and he calls especial notice to the fact hitherto apparently overlooked that if, in a depraved state of digestion from disease, solid food cannot be digested for the nourishment of the patient, solid medicines cannot be digested and appropriated to the cause of disease. Dr. Comstock, we think, might have gone a step further and questioned how far all large doses are beneficial, or in other words how much of the dose does the work and how much is simply excess and consequently foreign matter. The homœopathic practice of medicine furnishes any number of instances where infinitesimal quantities of specifics produce the most marked effect, certainly an effect as plainly apparent as that resulting from a large dose allopathically given. Now if the combining equivalents, so to speak, for a given result are present in one case, they are equally so in the other, the end reached being the same. Hence in the latter example it follows that a very large proportion of the dose is useless if not harmful, while it usually has the further demerits of being expensive and distasteful.

THE SUGAR INTEREST IN PERU.

BY PROFESSOR JAMES ORTON.

It is singular how exotics are becoming the ruling objects in Peru—Europeans, horses, sheep, sugar-cane, coffee, oranges, grapes, bananas, wheat, eucalyptus tree, etc. Peru, though rich in minerals, was never plentifully supplied with useful animals and plants; but possessed of every conceivable variety of climate and soil, she has shown herself capable of giving a congenial home to every form of life. Northern and Southern Europe can meet in this little Republic.

Among the foreign introductions, always excepting the immigration of Europeans, the sugar-cane is the most important. Better than guano or saliter, it is destined to be the surest and most inexhaustible source of the wealth of Peru. The annual yield of sugar and spirits is estimated at $20,000,000. The recent rise in the price of sugar has given a new impulse to its cultivation, and the prospect is that Peru will ere long be a formidable rival of Cuba and the other Indies. The usual cane crop in the West Indies is 1,130,000 tuns; in Java, 200,000; in Brazil, 170,000; in Louisiana, 75,000; in Egypt, 40,000. The crop in Cuba last year was thirty per cent below that of 1875, while the beet crop in France and Germany was well nigh a failure. In 1875, Peru exported 60,000 tuns; in 1876, over 70,000. That amount will be greatly increased this year, provided laborers can be obtained. But thousands of acres are lying idle for want of hands. In fact, the commerce of Peru is diminishing for lack of labor and capital, and Peruvian statesmen are anxiously looking to China for the one and to Mr. Meiggs for the other. The squint-eyed Celestials outbid and outdo the the mongrel races along the coast, and the mountaineers cannot endure the lowlands. But Chinamen must be better treated than they have been. Even now, great as is the demand for foreign labor, the natives, as in Trujillo, would persecute the Asiatics and drive them from their shore.

In no other country, save Egypt, is the cane crop so sure as in Peru. Occasionally, as in 1871, the crop may suffer by drought from want of the supply of water from the sierras; but in the course of ten years, the decrease would not amount on the average to more than twenty-five per cent. As the cultivation is regulated by irrigation as in Egypt, Peru has an advantage over Cuba, where planters depend on the weather. At present, Peru can compete with any other country, save Egypt, since she can grow the cane without intermission. The slave labor of Cuba cannot produce it so cheaply. The cane grows more slowly than in Louisiana, and hence is richer in saccharine matter. The amount of juice to the cane is about sixty-five per cent, and its average density is 10°. In Northern Peru, two tons of cane give four hundred gallons of juice, each gallon yielding 1·35 lb. of sugar. The best season for planting the cane is November, and the yellow variety (originally from India) is preferred to the red, being richer. The first planting takes fifteen months to mature; after that, the crops ripen every twelve months. This is true only of Northern Peru, where the soil is thinner but more tropical than at the south; in Cañete, for example, it takes fully two years for the first crop to mature. Three or four crops are obtained before replanting is necessary. The green and ripe cane are seen in the same field; there is cutting on one end and planting at the other; so that the ground is never idle. The actual time spent in the manufacture of sugar is eight months; the rest of the year is occupied in repairing acequias, etc. From the small establishments, the sugar is exported in the crude "concrete;" in the larger mills, it is first refined. For inland transportation, western Bolivia being supplied from Peru, it is put up in conical loaves, weighing 45 lbs. each

Under the present American tariff, refined sugar goes by New York to Europe, the law favoring the New York refiners without benefiting the consumer or the Government revenues. Then, too, the Hawaiian Reciprocity Treaty, allowing free importation of sugars from the Islands, tends to turn the sugar of Peru across the Atlantic.

The sugar cane is cultivated on both sides of the Andes, but it does not grow at a higher altitude on the western slope than 4,500 feet, while on the eastern side its limit is 2,000 feet higher. In the Marañon region, as at Moyobamba, Tarapoto, Aipena, and San Regis, and also in the Urubamba Valley (Upper Ucayali), it grows luxuriantly but will not give crystallized sugar; so it is turned into aguardiente. There the grain ripens in six or seven months after planting. Considerable sugar of excellent quality is manufactured at Abancay on the Apurimac, but rudely purified with clay; it is mainly consumed in Cuzco, where it brings forty cents a pound.

But the Pacific slope of Peru, particularly of northern Peru, is the great sugar district; there it is fast taking the place of cotton and rice. The whole coast presents a series of arid wastes and fruitful valleys—alternating Saharas and Edens. Nothing is wanting but water to convert the entire coast into a garden twelve hundred miles long. But it is worthy of remark that wherever the railroads run from the coast into the mountains, they seem to have changed the meteorological character of the lowlands, rains being more frequent on the coast terminus than formerly.

Every port above Callao exports sugar, those of Talaverry and Eten taking the lead. All told, there are about one hundred and twenty large sugar estates on the coast. Lambageque and Chiclayo contain eighteen, of which that of "Pátapo" is the chief and probably the largest in the country. It guarantees $5,000 a month freight to the railroad. The Pacosmayo Valley has fifteen, of which the "Lurifico" is the most important, and to which I shall recur. The rich valley of Chicama near Trujillo is crowded with sugar plantations: its twenty-four mills produce to the value of one million soles per month. The machinery is English. The "Casa Grande" of Sr. Albrecht is the most complete. Further south, near Chimbota, in the Valley of the Santa, are two large establishments, "Puenti" and "Viuzos;" the former has American machinery precisely like that of "Lurifico," only the charcoal process is not used. Choncay, just above Lima, has fifteen estates, of which "Palpa" is the largest, while around the capital are more than twenty, among them the well furnished establishment of "Santa Clara." In the valley of Cañeta are the extensive plantations of the late Henry Swayne, twenty-five hundred acres being under cultivation. There are also numerous cane estates in the departments of Ica and Arequipa, but they yield comparatively little sugar.

The "Lurifico Hacienda" near Pacosmayo being a representative establishment, I will describe it. The estate was once the property of the unfortunate President Balta, afterwards of Henry Meiggs. It now belongs to Mr. Ford of the house of Dreyfus & Co., and is under the superintendence of Mr. Kauffman, from Ohio. Two thousand acres are covered with sugar cane, the rest being given up to rice for the laborers. English steam plows are used in cultivation. The mill works were designed by Cahill and constructed by Morris of Philadelphia. They cost when put up $250,000. The engine is ninety horse power, and the roller weighs twelve tuns. Three small locomotives from Paterson, N. J., bring in the cane from the field and discharge it upon a "conductor" seven feet wide and one hundred and fifty feet long. The dried pressed cane, called "bagass," affords all the fuel used for engine and locomotives. There are twelve copper "defecators" or purifiers, each holding four hundred gallons; when full fed, the mill can fill eighty defecators daily. In the defecators, the juice, "guarapa," is treated with lime and heated by steam to 140° to remove acid and scum. Thence the liquor goes to two of the twenty filters filled with animal charcoal, and next into large iron tanks, whence it is transferred to three copper "vacuum pans" in succession, No. 1 having a vacuum of six inches, No. 2 of thirteen inches, No. 3 of twenty-two inches. In these it is boiled by the exhaust steam. When it leaves the third pan, it has a density of 27°, and is called "syrup." Carried to the clarifiers, where it is treated with steam to remove more scum, it passes next into the rest of the charcoal filters, and then into two other iron tanks from which it is drawn into a fourth copper exhaust pan, called "strike pan," with a vacuum of twenty-five, where it is boiled for one hour till it becomes a thick syrup. Then by letting in a small portion of thinner syrup, it grains, and by continuing this, the size of the grain increases. From the strike pan it goes into the "coolers," which are pans five by six feet on rollers. When cold, it is transferred to the "mixer," where it is stirred by machinery so that it will run into the "centrifugals," which make 1,200 revolutions a minute, to be deprived of its molasses. The coarse grained sugar thus made is called "muscabado" or "granulado" No. 1, and is exported in bags. The grains are apparently cubes, but are really monoclinic prisms. The molasses is taken to the "blow-up," where it is subjected to jets of steam, skimmed and taken to the strike pan, and made into sugar No. 2. The refuse molasses and guarapa are taken to the distillery and put into large vats for fermentation, thirteen all told, ten feet deep and ten feet in diameter; thence to the still, rectifiers, and condenser. Every day 1,400 gallons of rum of 40° are made.

The Lurifico works are capable of turning out per day 35,000 gallons of juice, requiring one hundred and seventy-five tuns of cane, or nearly 50,000 lbs. of muscabado. The length of the process from pressing the cane to bagging the sugar is two days, including one for cooling. In the field and mill there are 939 Chinamen, who get two rations of rice per day, one sol a week, and two suits of clothes a year. They all live within a small enclosure called "Galpón," adjoining which is an excellent hospital under the charge of Dr. Heath. They work ten hours a day—five hours before breakfast and five hours in the afternoon. On Sunday, which is pay day, they work but four hours. In less than four years the majority will be free, as their term of servitude will expire: some will re-contract for a year or two at higher wages, but many will set up for themselves, for the great ambition of the more intelligent Chinamen is to keep a shop or fonda. The labor question is therefore constantly revived, and is the uppermost topic at the sugar haciendas of Peru.

THE EMIGRATION OF AMERICAN MECHANICS TO ENGLAND.

During the past three months some three hundred and twenty-five mechanics have emigrated from this country to England under contract with English employers. In England, for some time past, building trade strikes have been the rule, and at present these are in progress in London, Manchester, and seven other large cities and towns. It is to avoid the effects of these strikes that employers seek to import American workmen, so that, in brief, the case is precisely the same as if railroad corporations here, during the late uprising, had imported English navvys and train hands to fill the places of their former employees.

Now we need not point out that this is a bad status for any workman in a strange country at the outset. Necessarily he becomes at once an object of aversion to the leagued members of his trade, and this is none the less intense because he is a foreigner. He will find, however unjustly, Yankee cheap labor in England placed beside Chinese cheap labor here—the difference recognized only in kind. Law and justice, it is true, are on his side, but the difficulties of his position will not be modified thereby. While his contract holds he may continue on, but at its close, or if he emigrates under no contract, then he comes into competition with the great mass of working men, and enters into a condition far worse than that which he left his own country to escape. The United States Consul at Liverpool has issued a public warning against the current report that fewer men are out of employment in England than in the United States. He says that many American mechanics are now in suffering and in destitution abroad; that able-bodied working men are constantly calling at the Consulate for relief which cannot be accorded, and he positively asserts that neither skilled nor unskilled working men from abroad can find employment in England. The English journals themselves express surprise at the emigration, and call it "a complete reversal of the ordinary course of things." As for any relief from labor troubles being gained, the *Engineer* reviews the present strikes in progress and sees no likelihood of any such result. On the contrary, it says that "facts do not predicate peaceful times for the emigrants." Our working men will find, moreover, that the English practice of their trades is not their practice; that English habits of life are not their habits; that, in short, they have got to begin and learn much that is new and strange before they stand on an even footing with their English tradefellows. And they will further find that if, after their contract time has expired, they return home, their years of labor abroad have not brought them nearer to independence, but that there are still new associations to be formed and a new start to be made. It is better to stay at home, better to be first sure that every channel of honest work in this country is exhausted, better to learn to live on reduced wages until the better times which must eventually arrive are at hand, for when they do come they will as certainly bring their rewards for those who

"Learn to labor and to *wait*."

PROGRESS OF THE SCIENTIFIC AMERICAN.

Probably there is no weekly periodical in the world whose separate issues are scanned by so many readers as the SCIENTIFIC AMERICAN. In the hundreds of libraries and reading-rooms where it is filed, no journal is in greater demand or more constantly consulted. In many villages each copy of our paper goes through a regular round of circulation and reading from one neighbor's house to another; and not unfrequently from a company of readers in one country to others in another country. For example: a Brazilian subscriber writes us that he receives his SCIENTIFIC AMERICAN in that country through a club; after himself and friends have enjoyed its reading, he forwards it to his brother in England; to be by him, after perusal, sent on to another brother in New Zealand.

In this way the effective influence of the SCIENTIFIC AMERICAN becomes very widespread and enormous; a fact to which our advertisers can testify by practical experience. No other paper brings them so many orders or such intelligent, excellent customers. We estimate the total number of our weekly readers at not far from half a million. The secret of this is that each number of the SCIENTIFIC AMERICAN contains valuable information, which is fresh and useful irrespective of the date of the sheet; and it travels through the world until it is worn out, furnishing entertainment and benefit to every reader into whose hands it falls.

INCREASING THE FLOW OF SPRINGS.

It is a well known fact that rain water and the water produced by melting snow on high land, sinks into the soil until an impermeable stratum is reached. Then it follows that stratum as the same tends downward, thus producing subterranean rivers or brooks. When a well is dug this underground water is sought for; but when the water itself comes to the surface, then the source is commonly known as a spring. In both cases, however, the water flows along a slope higher of course at the point of departure than at the point where the water is obtained. But during its journey obstacles are often encountered which check the flow, so that sometimes a well can be pumped out much faster than it will fill. Hence, after every drain upon its resources, it is necessary to wait a considerable period in order to allow the scanty influx to replace the amount of water removed. Such wells frequently dry up altogether during the present season of the year.

There is a simple way of increasing the flow of wells, devised some years ago by M. Donet, of Lyons, France. Ordinarily the mouths of wells are left open: hence all along the water, from well to original source, there is an equilibrium of air pressure. M. Donet's plan is simply to close the well and pump out some of the air. This creates an excess of pressure to drive water into the well; the supply is thus increased temporarily, and at the same time the underground channels through which the water passes are enlarged by the stronger stream, and so the supply also becomes permanently augmented.

In the case of a spring, however, one of the principal advantages is that the water lifts or ought to lift itself to the level of the soil, and consequently, when a pump is needed, then the source is no better than any ordinary well. There is a way, however, of increasing the flow of springs by the aid of a simple siphon, which has been devised by M. Chefdebien. At the point where the spring emerges make an airtight tank, having a close cover, into which insert a pipe. Bend this pipe over and carry it along for a few hundred feet or so, until by following the downward trend of the land, the end reaches a level, say six feet lower than that of the spring level. Now, apply a pump and draw water through this tube. It thus becomes a siphon (the pump is is at once removed), and the water continues to flow under the influence of a portion of the atmospheric pressure equivalent to the difference of level existing between the spring and the lowest end of the tube.

M. Chefdebien has tried this plan on a spring which took 24 hours ordinarily to fill a hollow place in the rock containing about 200 quarts. From the spring he led a piece of lead pipe four inches in diameter over a distance of 192 feet, so that he obtained a difference of level of nearly 8 feet A watertight and airtight vessel was also built on the spring basin, so as to surround the natural escape orifice. This was six years ago. During that time the water has run constantly; and instead of yielding 200 quarts per 24 hours, it has given 3,800 quarts steadily per same period. That is, the flow has, by the above simple expedient, been increased nineteen times.

Scientific Chess.

The *Boston Daily Globe*, in commenting upon the Chess Record in the SCIENTIFIC AMERICAN SUPPLEMENT, says: "We unhesitatingly give it as our opinion that there is no other Chess Department in any paper on the earth, under the earth, or in the heavens above the earth, that "can hold a candle to it." All those who miss seeing this department of Loyd's will miss a golden treasure."

Coming from any other source we might be inclined to regard such encomiums as mere flattery. But the *Globe* is a wide-awake newspaper, and its chess editor is one of the ablest writers in this sphere. If he does not know wheat from chaff, no one does.

Carrier Pigeons for the English Herring Fishing.

Messrs. Moir and Son have a number of pigeons pretty regularly employed for the purpose of bringing early intelligence of the results of the herring fishery, and the experiment has been very successful. One of the birds, says the *Aberdeen Free Press*, is taken out in each boat in the afternoon, and after the nets have been hauled on the following morning and the extent of the catch ascertained, the pigeon is despatched with a small piece of parchment tied round its neck, containing information as to the number of crans on board, the position of the boat, the direction of the wind, and the prospects of the return journey, etc. If there is no wind to take the boat back, or if it is blowing in an unfavorable direction, a request is made for a tug; and from the particulars given as to the bearings of the craft, she can be picked up easily by the steamer. The other advantages of the system are that, when the curers are apprised of the quantity of herrings they may expect, they can make preparations for expediting the delivering and curing of the fish. —*Land and Water.*

SIZING FOR SIGN WORK.—One of the best mordants or sizing for sign work is made by exposing boiled linseed oil to a strong heat in a pan; when it begins to smoke, set fire to the oil, allow it to burn a moment, and then suddenly extinguish it by covering the pan. When cold it will be ready for use, but will require thinning with a little turpentine.

REMEDY FOR POISON IVY.—E. A. Blood, of Bloomington, Ill., says that bran poultice is an infallible cure for poison ivy.