POTATOES AND THEIR UTILIZATION.

One of the leading qualities of the potato is its extraordinary productiveness, far exceeding that of any esculent with which it can be placed in competition, one authority placing the yield from an equal quantity of ground at thirty pounds of potatoes to one pound of wheat.

In 1870 there were nearly one hundred and forty-four million bushels of potatoes produced in the United States, and certainly much more than that quantity will be gathered this year. In spite of the great market for this staple of food, it very frequently happens, especially in some of the extensive farming districts in our Northwestern States, where transportation rates are high, that overproduction so affects their value as to make the tubers unprofitable to handle, and, as a consequence, thousands of bushels of them are annually lost or thrown away.

In this connection we have been so frequently asked for what purposes other than as a food the potato can be utilized, that we will endeavor to answer the question.

Potatoes are composed very largely of starch and water, their average composition in northern latitudes being: Water, 75 per cent; starch, 21 per cent; albumen, cellulose, fat, and salts, 4 per cent. The water can be expelled by exposure to heat at a temperature of about 212° Fah., the residue having the composition: Starch, 83·8 per cent; albumen, cellulose, fat, and salts, 16·2 per cent.

Nearly the whole of the starch can be separated from potatoes by simple and inexpensive mechanical operations, and as starch is a commodity for which there is always a good market, and as it can be stored for an indefinite time without danger of deterioration, it is obvious that potatoes may be profitably utilized in the production of starch.

The plant required to make marketable starch is quite simple and easily constructed by any intelligent farmer—a wire basket to wash the tubers, a rotary rasping machine, a few large tubs or watertight hogsheads, some wire and hair-cloth sieves, and a drying room, comprising the principal pieces.

A simple rasping machine is shown in Fig. 1, and consists of a band wheel, A, over the rim of which has been secured, rough side out, a piece of sheet iron previously roughed up like a nutmeg grater by punching it full of holes with a blunt-pointed tool. The wheel is mounted on an axle supported by the wooden frame so as to revolve immediately beneath the mouth of a metal-lined wooden hopper, B.

A more effective rasper or grinder is shown in Fig. 2. It consists of a cylinder, *c*, twenty inches diameter and two feet long, mounted on an axis. It is armed with steel saw plates placed about three quarters of an inch apart, parallel with the cylinder, and having small and regular teeth. The plates are held in position by iron clamps, so that the toothed edges project about four-fifths of an inch from the periphery of the drum. It is driven at the rate of about eight hundred revolutions per minute before the hopper, and is capable of pulping about forty-eight bushels of potatoes an hour. In both these machines the rasping surfaces are kept clean by the action of small jets of water projected with some force.

As the washed potatoes are passed through one of these machines the pulp and wash water is run off into tubs, and after the coarser particles have been deposited, the milky liquid is drawn off into other tubs and the starchy matter allowed to settle. Or, as in large factories, the pulp may be rubbed and washed through a series of sieves, ranging from coarse wire gauze to fine hair cloth. After repeated washings with fresh water in the tubs to separate the gummy and fibrous matters, the starch granules are finally allowed to settle, and after the water has been drawn off the pasty mass of starch and water is run off into long wooden troughs, slightly inclined, wherein the paste gradually hardens as the water drains off. When hard enough it is cut into blocks and put on shelves in a warm room to dry out. With good management from seventeen to eighteen pounds of clear starch can be obtained by these simple means from one hundred pounds of average potatoes, which could be disposed of in bulk at present prices.

Starch is not only used for "starching" and sizing fabrics and for various food preparations, but also for the manufacture of grape sugar, glucose sirup, gum dextrine or British gum, and alcoholic liquors. When gradually heated in the dry state to about 160° Fah., in a rotating cylinder similar to a coffee roaster, and kept at that temperature for a short time, the starch is transformed into a gummy substance called dextrine or British gum, soluble in cold water, and extensively used as a substitute for gum arabic.

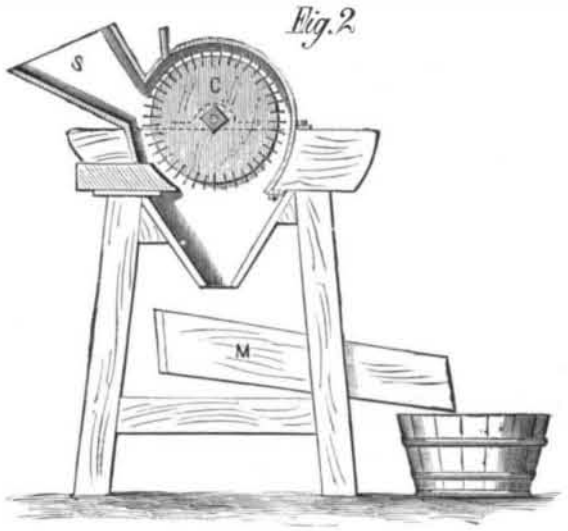
When boiled for a few hours with water containing a small quantity of sulphuric acid it is gradually transformed into grape sugar or glucose—a kind of sugar extensively used by confectioners, brewers, distillers, and wine makers. The acid used is removed from the sweet solution by adding to it the proper quantity of chalk or lime with which the acid forms an insoluble substance easily separated.

Whisky can be made directly from potatoes. The potatoes, after being finely mashed with boiling water are mixed with about five per cent of malt, the diastase of which on standing converts the starch into grape sugar, one and one half or two per cent of yeast is then added, and the fermentation allowed to proceed at a temperature of about 80° Fah., until the sugar has been converted into alcohol and carbonic acid. The alcoholic liquid when submitted to distillation yields whisky—one bushel of good potatoes yields about seventeen pounds of the liquor. The fermented potato mash can also be converted into a vinegar by allowing the fermentation to continue after the sugar has all been changed to alcohol, or more rapidly by passing the alcoholic liquid through an *Essigbilder* or quick vinegar apparatus. A cheap apparatus of this kind may be made from a large barrel, as shown in Fig. 3. The barrel is provided with a perforated false bottom at *a*, and a tight shelf at *b*. Birch shavings soaked in good vinegar are loosely packed into the space between the shelf and false bottom. The shelf is perforated with a number of

Fig. 1

small holes, through each of which is drawn a few strands of packing thread knotted at the top so as to loosely close the hole, *d d d*; in the figure are short pieces of glass tubing secured in larger holes in this shelf. Around the sides of the barrel, just above the line of the false bottom, are pierced a number of air holes. When a warm alcoholic liquid is poured over the upper shelf of this apparatus it gradually trickles down through the pack thread and over the shavings, where it is brought into intimate contact with an upward current of air from the air holes below to the glass tube exit above, and is gradually changed into vinegar which

Fig. 2



collects in the portion beneath the false bottom and flows off through the curved siphon tube, *g*. If the barrel is small it is usually necessary to pass the liquid through the apparatus three or four times before acetification is complete.

Recently a company has been formed in California for preparing (among other things) desiccated or dried potato. The drying is accomplished by passing a current of dry air, at a temperature of about 140° Fah., over the potatoes, cut in very thin slices, in kilns or ovens provided with a system of movable shelves. Doubtless a large demand for such an article would not be difficult to develop.

Fig. 3

Boiled (dry) potato mixed with zinc chloride and barytes has been used to form an imitation alabaster and coral-like composition.

AGRICULTURAL INVENTIONS.

An improved arm seeder has been patented by Mr. Philip Strong, Jr., of Saranac, Mich. This device is to be carried or worn by the person using it, by means of which all kinds of grain or seed may be scattered or sown broadcast over the ground evenly and with less exertion than heretofore; and the invention consists, principally, of a bag having a flexible tube or smaller portion connected to a sectional metal distributer, which is provided with a valve, and adapted to be swung from side to side for throwing and scattering the grain, the supply of grain from the bag being regulated by means of the valve.

An improved cotton chopper has been patented by Mr. Jay J. Johnson, of Aberdeen, Miss. The object of this invention is to facilitate the chopping of cotton and other drilled plants to a stand.

An improved fence has been patented by Mr. Jesse M. Womack, of Log Town, La. The object of this invention is to economize space and material and produce a substantial and durable fence.

An improved cotton chopper has been patented by Mr. Friederich A. Helmecke, of Round Top, Texas. This invention consists in a novel construction and arrangement of devices for raising and lowering the hoes and throwing them in and out of gear.

An improved harrow, patented by Mr. Benjamin Jones, of Orange, Ill., has a series of long stationary beams, a series of short stationary beams interposed between the rear parts of the long beams, the connecting cross bars, and moved by crank rods pivoted to the stationary beams.

The Great Fires in Michigan.

While the loss of life during the terrible fires in Michigan, during the first week in September, proves to be less than was at first estimated, the resulting distress is far greater than any one supposed possible. The state of the afflicted communities is accurately described in the proclamation of Governor Jerome, dated Detroit, Mich., September 15. He says:

"Portions of four counties of this State, lying principally between Saginaw Bay and Lake Huron, have been devastated by forest fires. A drought, almost unprecedented in this section of the country, had prepared the way for the calamity, and houses, barns, fences, crops, cattle, agricultural implements, household furniture, clothing, and human life have been destroyed by its ravages. In some townships the destruction is complete, and only a picture of ruin left. It is known that more than 200 lives have been lost by burning and suffocation. Many individuals have become helpless through injuries and exposure, and some are blind. The number of men, women, and children left without shelter is estimated at 15,000. The benevolence of the citizens of the State responded promptly to the first necessities of these afflicted people, but ample time has now elapsed, and sufficient details have been received to make it evident that a wider appeal is needed. The destitution prevailing in the suffering counties is appalling. Entire neighborhoods are involved in a common calamity, and cannot help each other. Sufferers have no provisions, except such as are brought from a distance, and no utensils to cook with. Necessaries of life, both large and small, have been destroyed. They need shelter, clothing, shoes, cooking stoves, kitchen utensils, beds and bedding, wagons, harness, plows, hoes, tools of all kinds, seed for future crops, and whatever helps to make men self-supporting."

Four days later, after traversing a large portion of the burned district, Governor Jerome announced that his estimate of the loss of life and the number of sufferers was not exaggerated.

The burnt district covers a territory of about 1,800 square miles, about one half of which escaped the flames; the other half is a blackened waste, the destruction of property being pretty evenly distributed over the whole territory. It was an agricultural country, with occasionally a village or small business center, where were flouring mills, sawmills, stores, churches, etc. Many of these places and their industries were wholly destroyed, and in the farming portions, in the track of the fire, nothing is left for man's use but the land. Barns, cattle sheds, and structures of every kind that remain are being utilized as temporary shelter for the homeless. Hospitals for the care of those who suffer from burns are already established.

Any one who has had experience of forest fires on a considerable scale will be able to frame a faint conception of the terrible whirlwind of flame that burst upon the Michigan settlers that fatal morning. Words are inadequate to convey any idea of it.

The Governor says further:

"The aid extended to the unfortunate by those whose homes were saved will soon exhaust the surplus of the latter. What these people require is aid to procure such necessities as will enable them to live upon and till their lands. They must have food until the harvests of 1882 are gathered. Anything short of this will fail to accomplish the undertaking.

"The first effect of this disaster was to stupefy or paralyze the energies of these people. The prompt aid and encouragement received have stimulated them to new efforts to help themselves. With the bare land and their labor only left they begin to build anew. Already many are constructing log houses, and every available team is being worked with vigor to put in wheat, the seed for which is furnished by the relief committees. They appreciate their condition and the necessities for labor, and will struggle hard to do their part as they have the opportunity."

The attention of the public has been diverted somewhat from the Michigan sufferers by the national affliction through the death of the President. It has been suggested that the materials used in draping dwellings and business places be contributed to the victims of the fire. Very much of the material may be made useful for clothing, bedding, and other household purposes; and liberal gifts of clothing and money would be likely to accompany such contributions. Winter is fast approaching, and what is done should be done speedily.