

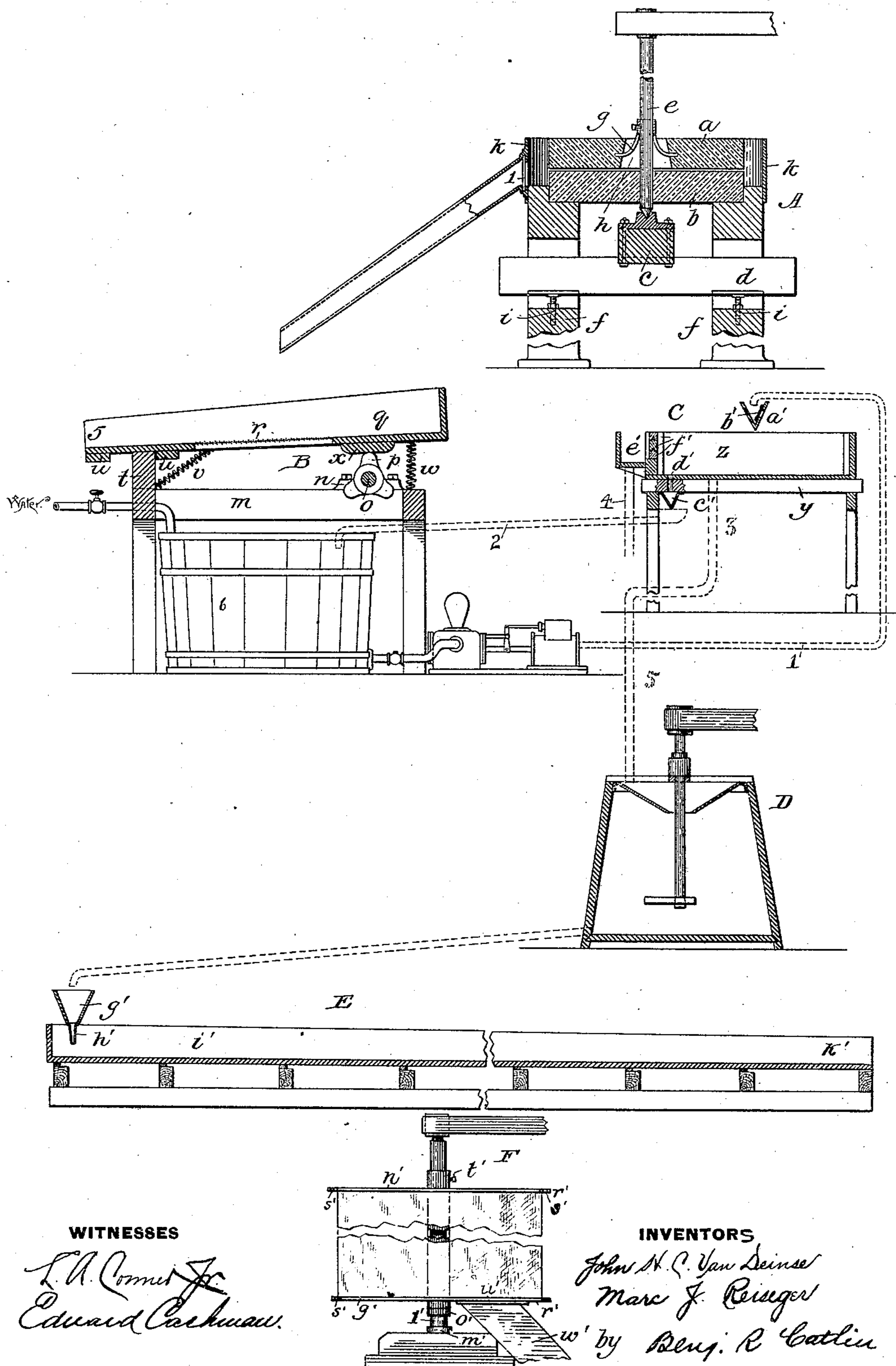
(No Model.)

J. H. C. VAN DEINSE & M. J. REISEGER.

ART OF MAKING STARCH.

No. 444,127.

Patented Jan. 6, 1891.



UNITED STATES PATENT OFFICE.

JOHN H. C. VAN DEINSE AND MARC J. REISEGER, OF MUSKEGON, MICHIGAN.

ART OF MAKING STARCH.

SPECIFICATION forming part of Letters Patent No. 444,127, dated January 6, 1891.

Application filed December 3, 1889. Serial No. 332,385. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. C. VAN DEINSE and MARC J. REISEGER, residents of Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in the Art of Making Starch; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

The object of the invention is the economical production of a pure potato-starch; and it consists in the process and apparatus hereinafter described and pointed out.

In the manufacture of potato-starch as heretofore practiced the method and apparatus employed have failed to separate and recover the starch completely, and they have also failed to certainly and thoroughly cleanse the same and preserve its purity and whiteness. According to the most common method, cleansed potatoes are reduced to pulp by graters. The pulp is then conducted onto wire screens, which are simultaneously shaken endwise. The starch thus separated from the pulp is mixed with water and allowed to stand in suitable tanks until it has separated and settled to the bottom, mixed, however, with other portions of the potato. The water being drawn off, the residue is again mixed with water and settled, and the water again drawn off, whereby the starch is partially purified. It is then dried in kilns, where it is more or less discolored. By this mode of procedure from about six to eight pounds only of starch, and often of an inferior quality, have been obtained per bushel of potatoes, though a bushel contains from sixteen to twenty-four per cent. of pure starch, or from nine and six-tenths to fourteen and four-tenths pounds.

The accompanying drawing illustrates an apparatus for carrying out our improved methods.

A indicates a mill suitable for grinding grated potato-pulp, in which *a b* indicate the stones.

c indicates a cross-beam resting upon timber *d*. Upon this beam is situated a socket in which the shaft *e* is stepped in such man-

ner as to be freely revolved therein. The stone *b* is supported by any suitable foundation *f f*, and the stone *a* by the shaft *e* through the medium of the spider *g*, situated in the eye or opening *h* through said stone.

i indicates a device for raising and lowering the timber *d* and stone *a*. An outlet from the annular space inclosed by the band *k* is indicated at *l*.

B denotes the sieving apparatus and *m* its frame, at one end of which are two journal-boxes *n n* for the shaft *o*, to which is secured the wheel *p*, having three projections, as indicated.

q denotes the sieve-frame having an imperforate bottom except at *r*, which denotes the sieve proper. The frame *q* may incline slightly toward its open end *s*, where it is supported on a cross-beam *t* of the frame.

u u denote cross-bars of the sieve-frame, one on each side of the support *t*.

v w denote springs secured to the sieve-frame and to the supporting-frame.

x denotes a plate or piece secured to the bottom of the sieve-frame to receive the impact of the projections of wheel *p*, when the latter is revolved, by which the upper end of the sieve-frame is alternately raised against the tension of the spring *w* and lowered under the action of the same spring as a projection is carried off and away from plate *x*. The spring *v*, in co-operation with support *t* and bars *u u*, prevents the sieve from being carried too far in a horizontal direction. The combined effect of these devices is to effectually tumble the contents of the sieve, by which the ground material has its particles thoroughly separated and the coarser parts of the refuse are carried off at the discharge end of the sieve or left thereon to be subsequently removed. The starch with the remaining portions of the refuse passes into a receptacle *6*, placed below the sieve, from which it is conveyed in any convenient manner to a settling-tank.

C denotes settling apparatus.

y is a frame supporting the receptacle divided into basins by the partitions *z*. A V-shaped trough for conducting starch and water to these basins is indicated by *a'*. Outlets from the trough are provided, one or more

for each basin, suitably closed, when desired, by doors or slides b' . A similarly-shaped trough for permitting an escape of water from these basins is indicated at c' . Outlets from these basins formed by partitions z are indicated at d' . e' denotes a trough for draining off the surface water from the basins after the starch has settled. It communicates with said basins by passages that can be closed by the matched and grooved pieces $f'f'$, of which there are several in each passage or outlet. In practice these are removed one by one and gradually to effect the removal of the water without disturbing the settled starch.

4 indicates a pipe for emptying trough c' .

The dotted lines 1 indicate a pipe, through which the sifted pulp may be pumped from the receptacle 6 after it has received the same from the sieve, which material may be diluted with water through a suitable inlet-pipe communicating with said receptacle. Dotted lines 2 indicate a pipe by which starch adhering to the settling-tank C and subsequently removed by washing can be conveyed back to receptacle 6. The fine impurities having been decanted or floated from the upper part of tank C the residue is conveyed in any suitable manner, as by a pipe 3 5, to the stirring-receptacle.

D indicates a stirring apparatus of any approved construction, wherein the starch freed from the lighter impurities is thoroughly mixed with a fresh charge of water and the portions of the impurities that remain either because their gravity prevented removal in the preceding step, or because they were entangled with the starch, are now freed from the starch and thoroughly separated preparatory to the next step, whereby they are gradually washed from the starch.

E denotes "slides" or inclined planes, preferably about forty feet long, for the final purification of the starch. It is conducted to these by the troughs g' , provided with pipes or tubes h' , two or more to each slide by preference.

$i' i'$ denote partitions which separate the several slides, and k' the lower or delivery end of the same.

F denotes a centrifugal drying apparatus.

l' indicates a vertical shaft suitably stepped in a socket or seat m' , resting on a proper foundation. Upon this shaft is secured a disk or head n' , which may have a collar or tubular axis resting upon a band or other support o' , rigidly secured to the shaft, the collar being made fast upon the same by set-screws t' .

g' denotes a skeleton head secured to the shaft and parallel to disk n' . Upon these heads or disks $n' g'$ is secured, preferably, fibrous material, such as cheese-cloth or muslin. The lower disk is provided with an outlet u' , having a sliding cover and communicating with a delivery-spout w' .

According to our process cleansed potatoes grated by any approved apparatus are introduced into a mill, such as described, and

ground preparatory to the separation of starch therefrom. The thoroughly-comminuted pulp is run from the mill mixed with water and passed into the sieves, which tumble the pulp and thoroughly toss it upon the reticulated surface of the sieve, whereby a complete separation of the starch from the woody fiber and cellular matter is effected. This, in combination with the above-described grinding, removes the main part of the waste matter and facilitates the subsequent cleansing operation. After the sieving operation the starch is settled in the basins, and the water carrying fine impurities is decanted by means of the removable gates, which are successively removed to leave a gradually-lowered fluid-exit. The water used for cleansing the settling-basins after removal of their contents contains some starch and is conducted to tanks underneath the sieves. The starch thus partially cleansed is next thoroughly stirred with water, for the purpose of separating and removing those heavier impurities which were not floated off by the preceding step. These heavier particles having been removed, by drawing off the superincumbent water other water is added, and the fluid, with starch and fine impurities held in suspension, is next conducted upon slides or long planes slightly inclined, and is allowed to drop slowly thereon or drop by drop. The starch by its specific gravity settles down gradually, while the water, carrying therewith the fine particles of the cellular matter and other impurities contained and entangled (up to this stage of the process) in the starch, flows off at the lower ends of the slides. All the impurities having been removed by the drawing-off process last above described, the purified starch is introduced into the centrifugal drying-drum, having, preferably, a fibrous periphery, as set forth, by which the remainder of water is quickly thrown out through the interstices of the fabric, leaving the starch pure, snow-white, and in larger quantity than heretofore obtained.

In the above-described operations pure water will of course be used, and the most approved methods of transferring the water and pulp employed. Preferably the various receptacles will be so disposed as to permit drawing the contents from one to another in proper order to avoid unnecessary pumping, and ordinarily V-shaped gutters will be used.

It will be understood that the distinct devices, mills, sieves, settling-basins, slides, and other parts will be used in such numbers and relative arrangements, and with such intermediate tanks, conduits, pumps, and the like as may be adapted or preferred by those skilled in the art. It should also be noted that our process may be applied to a variety of farinaceous tubers or vegetables.

We are aware that it is not new to grind corn for the production of starch, and that the sieves, settling and stirring tanks, and other like devices have been used.

It has heretofore been proposed to finely grind residues containing the waste matter of the potato intermingled with portions of starch, and we do not broadly claim fine grinding in processes of starch-making. Such former mode of procedure involved a repetition of the starch-separating methods, and the product of the fine grinding was inferior, because of the predominance of waste matter, from which the starch could not be thoroughly separated. By our method the entire substance of the tuber is finely ground at the beginning of the process, whereby the cellular structure of the potato is broken down and the entire separation of a large product of starch of superior quality is made practicable without special repetition of the washings.

It is characteristic of our improvement that potato-pulp is finely ground by means adapted to thoroughly break up its cellular structure. The importance of this has not heretofore been perceived, nor has any efficient means been used for accomplishing this and saving the large portion of starch usually lost with the woody and cellular fiber that is left on the seive, and thrown away as refuse.

It is further characteristic of our improvement that we subject the thoroughly-ground potato-pulp to a jolting or tossing action on sieves, which at an early stage separate all the starch of the potato-pulp from the coarser parts of the refuse. The steps of thorough stirring, washing, and decanting, and the draining on long narrow slides or inclines, carried out substantially as set forth, in combination with the preceding operations and

the subsequent rapid drying without the use of heated air or similar means, all co-operate to produce an exceptionally fine white starch in relatively large quantity.

Having thus described our invention, what we desire to secure by Letters Patent is—

1. The improvement in the art of making starch, which consists in finely grinding farinaceous tubers or vegetables, jolting the finely-ground pulp upon sieves to separate the starch, washing and settling the starch, and removing the dirty water by gradual decantation, stirring the settled starch with an addition of fresh water, and removing the remnant of fine impurities by dropping them and the starch in a state of suspension slowly upon inclined slides or planes, and finally expelling the remainder of water from the purified starch by centrifugal action, substantially as set forth.

2. The improvement in the art of making starch, which consists in finely grinding the entire substance of the tubers and separating the whole product of starch from the ground pulp by sieving and washing and then drying the purified product, substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

JOHN H. C. VAN DEINSE.
MARC J. REISEGER.

Witnesses:

JOHN R. GHENT,
A. W. GUTHAT.