E. Whitney,

Cotton Gin.

Patented Mar. 14, 1794.
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Eli Whitney.

To all to whom these presents shall come, greeting:

I certify, That the annexed Writing and Drawing of a New Invented Bollon Gin, or Machine for cleaning and separating bollon from its seeds, have been deposited in this Office by Eli Whitney, and still remaining there:

In faith whereof, I, James Madison, Secretary for the United States of America, have signed these presents, and caused the seal of my Office to be affixed hereunto, at the City of Washington, this Twenty-fifth day of November, A.D. 1803, and in the Twenty-eighth year of the Independence of the said States.

James Madison

Description of a New Invented Bollon Gin, or Machine for cleaning and separating bollon from its seeds.

The Machine may be described under five divisions, corresponding to its five principal parts: viz. 1st. The Frame; 2d, the cylinder; 3d, the breastwork; 4th, the cleaner; and 5th, the hopper.

1st. The frame, by which the whole work is supported and kept together, ought to be made of well-seasoned timber, so that it may be firm and steady, and never become loose in the joints. Scantling four inches by three, will perhaps be sufficient, of a suitable species and kind. The frame should be of a square or parallelogramic form, the width must answer to the length of the cylinder, and the height and length may be proportioned as circumstances shall render convenient.

In the Description annexed, Fig. 1, is a section of the machine. A represents the cylinder, B, the breastwork, C, the cleaner, and D, the hopper.

2d. The cylinder is of wood; its form is perfectly described by its name; and its dimensions may be from six to nine inches in diameter, and from two to five feet in length. This cylinder is placed horizontally across the frame, in such manner as to give room for the cleaner on one side of it, and the hopper on the other, as in Fig. 1.

Its height, if the machine is worked by hand, should be about three feet four inches, otherwise it may be regulated by convenience. In the cylinder is fixed a small rod, so large as to turn in the bath without quivering. The axis may...
pass quite through the cylinder or consist only of gudgeons, drawn with cement into each end. These must be shouldered, Fig. 10, on each side the bearing-box to prevent any horizontal variation in the cylinder. The bearings of the axis, or those parts which rest on the floor, must be rounded in a lathe so that the centre of the axis may coincide with the centre of the cylinder. One end of the axis should extend so far without the frame as to admit the winch by which it is turned, to be connected with it at C, and so far at the other end as to receive the wheel designed for putting the clearer in motion.

The brass boxes in which the axis of the cylinder turns consist each of two parts, C, C, D, D, Fig. 7. The lower part, C, is sunk into the wood of the frame to keep it firm and steady, and the upper, D, is kept in its place by a small iron bolt, H, H, fixed on the lower end at H. These bolts are inserted into the indents of the rail or scantling of the frame and continued up through both parts of the box. A portion of the bolts, at H, a, should be square to prevent them from turning. The upper part of the box, C, is screwed down (close) with a nut on the end of each bolt. At e, is a perforation for conveying oil to the axis.

After the cylinder, with its axis filled and rounded, is placed in its准确 place, the circular part of its surface is filled with beetle from an annular space. This space is filled with rough or fine grinding stone. The spaces d, e, f, g, h, Fig. 11, between the rows of teeth must be so large as to admit a certain width to turn round freely in them every way; and ought not to be less than seven sixteenths of an inch. This space is, e, f, g, h, Fig. 11, between the teeth, in the same row, must be so small as not to admit a hair or of a half inch. They ought not to exceed one sixteenth of an inch, and I think about one sixteenth of an inch the best.

The leather made and set in the following manner:

(Cake) warm wire wire. About four, 12, 13, or 14. Draw it about three times without winding in order to stiffen it, put it into pieces four or five feet in length and straighten them. Then with a machine, somewhat like that used for cutting nails, cut the wire into pieces about an inch long. In the jaws of this machine at Q, Fig. 10, are placed the two pieces of steel, d, d, which are pressed together as may be seen from the figure, by the operation of compound levers. These pieces of steel are set in such a way that when being pressed together their approaching surface, must only on the sides meet d, d, leaving between them a wedge-like opening, which in large, as the distance from the place of contact increases. On the side d, d, about an inch distant from the place of contact, the wire would perhaps be best, if it were not too expensive.**
is fixed a gauge. The wine is sealed on the side opposite it, d, d, and the end to the gauge. Then in forcing down the lever, the wine is separated, leaving the end of the wine next the side, c, c, smoothly and transversely off and the end of the alcohol, flattened like a wedge. The flattened end is then thrust forward to the gauge and the wine separation is repeated. In this manner the teeth are cut of equal length, with one end flattened and the other cut directly off. Flattening one end of the wine is beneficial in two ways: 1st. The flattened ends of the teeth will drive into the wood with ease and speed; and 2nd, it prevents them from turning after they are set. To prevent the wine from bending, while driving, they are held with pliers the jaws of which ought to be about half an inch in width, with a corresponding transverse groove in each jaw. Thus held, the teeth are, with a slight hammer, driven one by one into the cylinder, perpendicular to its axis. Then, without a tool, like a shepherd common saw, draw each tooth inclined directly toward the tangent to the point of the circle into which it is set, till the inclination is such that the tooth and tangent form an angle of about 35 or 60 degrees. If this inclination be greater, the tooth will not take sufficient hold of the calf; if it be less, they will be more difficultly in disengaging the bottom from the hole, after it is separated from the wood.

When the teeth are all set, they should be cut of an equal length. In order for this to be accomplished, Fig. 8, having two springs, g, g, the curvature of which correspond with that of the cylinder. This gage is merely a curved fork, the thickness of spoon or piece of steel, about a third the length of the tooth, and is applied to the cylinder with one limb on each side of a line parallel to the tooth. With a pair of cutting pliers cut the teeth 1, 2, 3, &c., off even with the gage; then slide it along to 4, 5, &c., and so proceed till you have trimmed all the teeth to an equal length. This done put the cylinder in a lathe and with a file bring the teeth to a kind of angular point, resembling a wire flattened and cut obliquely. After the teeth are brought to a proper shape, smooth them with a polishing file and the cylinder will be finished.

Remarks. Though the dimensions of the cylinder may be varied at pleasure, yet it is thought that those described are the best being more easily made and kept in repair than those of a larger size. The timber should be quartered, i.e., a square of the trunk of the tree, otherwise it will crack in seasoning. It must also be wood of equal density, such as hickory, maple, black birch, &c. I would
and in some other kinds of wood the rice is not driven into those spaces and is made to pass through the grain itself, and the rice driven into those spaces would not stand sufficiently firm, while the grains would have a tendency to prevent the path from being driven without bending.

III. (The) breastwork, Fig. 11, and D, Fig. 4, and Fig. 2, is fixed above the cylinder, parallel and contiguous to the same. It has breastwork openings through which the rice is fed into the path as the cylinder revolves, and its purpose is to obstruct the rice while the cylinder is carried forward through the grooves by the path. That side of the breastwork near the cylinder should be made of brass or iron (that is more durable). Its face is straight, Fig. 1, and it is driven on an angle with the horizontal, Fig. 2, less than 30 degrees. The bolt entering from A, into the breastwork B, fastens itself upon a certain quantity of rice, which is still connected with its seeds. The seeds being too large to pass into the breastwork, are carried up, while the cylinder is forced through the groove, and discharged from the seeds. Now if the path of the rice was before the groove, or that part passed the cylinder, it would be the same which it had collected in coming from B; but if the path of the rice was to the groove before the path, part of the rice would not pass it will slide off, and this latter case is preferable as it helps to give the rice a rotary motion in the hopper. The thickness of the breastwork, or the distance from A to B, Fig. 1, should be about 2 1/2 or 3 inches, in proportion to the length of the bottom. It should be such that the rice, which is carried, is by the teeth may be disengaged from that which is left in the hopper before it leaves the groove, otherwise that which is carried partly through the breastwork will by the motion of that with which it is connected in the hopper become so collected and knotted together as to obstruct and bind the path.

The under part of the breastwork near the cylinder ought, as has been before observed, to be made of iron or brass. I may be cast either in a solid piece and the openings for the passage of the rice cut with a saw, and filed, or in as many parts as there are spaces between the several rows of teeth in the cylinder and iron of Fig. D, and the piece set by means of a hammer bow; in a groove running lengthwise along the middle part of the breastwork.

The breastwork described, if properly constructed, will it be thought answer every valuable purpose. But I shall mention one of a different construction which I have

* A principle of which I have noted to make the breastwork of the upper part, not from a groove (the metal part and
not be more than 1/2 to 1/2 of an inch in height.
used with success, and is made in the following manner:

Form a breastwork of the same shape and dimensions as the one before described, entirely of wood. Place a bar of wood one inch below the cylinder, and parallel to it. Then wind straps or ribs of iron, brass or iron plate, over the breastwork of wood with the bar below. The ribs or straps must be so applied as to sit close to the surface of the cylinder, between the wooden breastwork and the bar, and of a width that will permit them to work freely between the annular struts of steel. That end of each strap which is fastened to the breastwork should divide widthwise into two parts, one of which should pass along the lower surface of the breastwork and the other running its front. In Fig. 1, B, is the wooden breastwork; D, the bar below the cylinder, the dotted circle b, b, the cylinder; e, e, the straps, c, c, placed under the strap divides, and a, a, a, wood screw or nail with which the straps are made fast to the breastwork. F. The chains, c, Fig. 1, are made in the following manner: take an iron axis perfectly similar to that described as being through the cylinder, except that it need not be so large nor fitted for the application of a wrench. Lay together crosswise at right angles two pieces of timber of suitable size and of a length about equal to the diameter of the cylinder, so as to make the four arms equal in length, and insert the axis in the centres of two crosses or frames of this kind. Set their distance from each other and third of the length of the cylinder, and make them fast on the axis. The arms of the two crosses are then connected by four pieces of the samelength of the cylinder, equidistant from the axis, and parallel to the same, and to each other. In each of the parallel pieces, on the outside or side opposite the axis, a channel is made lengthwise for the reception of a brush. The brush is made of hog's bristles, set in a manner somewhat similar to that of setting seeds in a weaver's shed. Between two strips of wood about 3/4 of an inch in thickness and half an inch in breadth, is placed a small quantity of bristles; then a strong thread or twine is wound around the pile close to the bristles, and another quantity of bristles is inserted; thus a brush is formed equal in length to the cylinder. The bristles on the sides a, a, Fig. 6, are secured with pitch, resin and seared down with a hot iron, even with the wood, to prevent them from drawing out. On the other side, they are cut with a chisel to the length of about an inch from the wood. A brush of this kind is far

* Perhaps winding the straps together would be better than winding them with iron.
in each of the before mentioned channels.

The bars as well as axes of the cleavers are like those of the cylinder. The cleavers placed horizontally with the cylinder parallel to it and at such a distance that while it revolves the ends of the blades strike with a small degree of friction on the cylinder surface. It is used to brush the cotton from the teeth after it is forced through the grooves and parallel to the teeth. It turns in a direction contrary to that of the cylinder and should be carried on at a complete to sweep the whole surface.

To cleavers with two brushes may be made by simply screwing upon the axis, the broad F, Fig. 1, and another similar brush on the opposite side which leaves spaces for the insertion of the brushes. The cleaver may also be formed of a cylinder with grooves running lengthwise in it for the reception of the brushes or in any other way which may be convenient.

The number of brushes in the cleaver is not material; let it be observed that the distance from t to e, Fig. 1, between the brushes must be at least 3/5, in order, otherwise the cotton will wind around the cleaver. The surface of the cleaver moving much faster than that of the cylinder, the brushes sweep of the cotton from the teeth. The air put in motion by the cleaver and the centrifugal force of the cotton disengage it from the brushes. Now, it is best to set the brushes in the grooves in such a manner that the teeth will make an angle of 20° or 35° with the diameter of the cleaver, in the direction, e. v. Fig. 1, by that means the teeth will be more perfectly and cleanly of the cotton more effectually.

The cleaver is put in motion by the cylinder, by means of a band and whirl. The whirl is placed of solid wood about 2 or 3 inches thick. Their periphery is spherical, surface swelling at the centre, and sloping off at the edge. To give them the proper shape, take a perfect globe of the same diameter as your intended whirl, insert it upon it a circle dividing it into two equal parts, then cut the globe across side parallel to the plane of this circle, and at the distance from it of half the thickness of your whirl. On these whirls you may hang leather bands; the breadth of which answers to the thickness of the whirl. The band may be broader or narrower, and the whirl thicker or thinner in proportion as the resistance to be passed.
encompasses the great or low. The reason for giving the wheel this shape is to some extent better from being unbounded. A band of this kind is always inclined to the highest place on the wheel, and is much less liable to be caught off from the work, when it runs upon a friction surfaces, than when it runs in a groove in the periphery of the wheel.

(The wheels are few in number, and must be so arranged as to make their central planes coincident. The wheel E, Fig. 8, is placed upon the end of the axis of the cylinder without the frame, and the button A, Fig. 8, is screwed down with the screw B, to keep the wheel in its place. I, is put upon the axis of the cylinder in the same manner. P, Q, whose axes are perpendicularly placed in the frame, are also wheels added for two purposes: 1st. to make the cleat turn in a contrary direction from the cylinder; 2nd. for the purpose of doubling the band in more completely around the small wheel, I, in order to bring a greater portion of the wheel surface into contact with the band; increase the friction and consequently turn the wheel more forcibly. The first of these purposes might be accomplished by the addition of an extra wheel, but the second not so fully without two. The dotted line, w, w, represents the band. The diameters of the wheels E, I, should be so proportioned as to produce a proper degree of velocity in the cleat. The axis of the wheel P, is fixed in a plate of iron which is moveable in a groove in the side of the frame, and the band is made tight by means by proving the plate. The arrangement of wheels produces the same movement as a cog-wheel and pinion, with much less friction and expenses, and without the rattling noise which is always caused by the quick motion of cog-wheels. V. One side of the hopper is formed by the breadthwork, the other ends by the frame, and the other side is movable so that as the quantity of bottle put in at one time, decreases, it may slide up near the cylinder, and make the hopper narrower. This is necessary in order to give the seed a proper motion in the hopper, by bringing them repeatedly up to the cylinder, till they are entirely stripped of the collet. D, Fig. 1, is a section of the movable part of the hopper. The part from F to I, should be made cove on the side next the breadthwork, and should be a portion of a hollow cylinder. Between Hand Y, is a scale of wire, which the bands and the seeds, as soon as they are thoroughly cleaned, fall into a receptacle below. The mate may be either fixed in the frame or fastened with the movable part of the hopper. The wire of which the scale is made should be large and placed perpendicularly to the cylinder, so that the bottom may turn the more easily.
in the hopper.

A few additional remarks will sufficiently show the construction, use, and operation of this machine.

(The cotton is put into the hopper, I. D. H. b. a. p. Fig. 1, in as large quantity as the cylinder will put it in motion, some of the seeds being stripped from them the first.

If it be black seal cotton, the seeds being smooth, will most of them fall through the cylinder as soon as they are clean, but a considerable part of the green seeds, which are thus demounded from being covered with a kind of green coat, resembling green, will continue in the hopper. It will not answer therefore to supply it gradually as the quantity is diminished, because the seeds will soon grow cumbersome and by their constant intervention prevent the seeds from attaching themselves to the cylinder as fast as they otherwise would; but each hopper, full of cotton, be finished, the movable part drawn back, the hopper cleared of seeds, and then supplied with cotton anew. There is a partition, a, under the cylinder, on the left hand of which, or the side beneath the hopper, the seeds fall, and the clean cotton on the other side. There may be accepted for the clean cotton the frame, but it is best to have an opening through the wall or partition into a contiguous room, then place the end of the machine against this opening and let the cotton fly into a closet or room. Or it may fall through an opening in the floor into a room below. The machine may be turned by horses or water with the greatest ease. It requires no other attendance, than putting the cotton into the hopper with a basket or fork, narrowing the hopper, when necessary, and letting out the seeds after they are clean.

One of its peculiar excellencies is, that it cleans the kind called green seal cotton, almost as fast as the black seed. If the machinery is moved by water, it is thought it will diminish the usual labor of cleaning the green seal cotton at least forty nine fifths.

The foregoing is a Description of the machine for cleaning cotton, alluded to in a Petition of the Subscriber, David Philadelphia, June 20, 1779, and lodged in the Office of the Secretary of State, alleging that he, the subscriber, is the inventor of said Machine, and signifying his desire of obtaining an exclusive property in the same.

Signed in presence of

John legend, a scrivener at New, Hartford
John Allen, a scrivener at New, Wethersfield

Eli Whitney

I, Eliphalet Goodrich, Esq., Alderman for said city, and Notary Public, by virtue of authority admitted and sworn, residing in said city, and by said authority to administer Oaths, do hereby certify, declare, and make known to whom it may concern, That at said city, on the twenty-eighth day of October one thousand eight hundred and ninety-three, Eli Whitney, of the County of New Haven, in the State of Connecticut, resident in the town of West Rock, appeared before me, the said Alderman and Notary, and, made solemn oath, that he does verily believe, that the said Eli Whitney is the true inventor and discoverer of the machine for spinning cotton, a Description whereof is hereunto annexed, by me, the said Alderman and Notary, by my hand, subscribed, and that he the said Eli Whitney verily believes that a machine of similar construction hath never before been known or used.

In testimony whereof, I the said Alderman and Notary have hereunto set my hand and seal at the city aforesaid on the day aforesaid.

Eliphalet Goodrich, Alderman & Notary Public.

(Handwritten date)

Received and recorded. May second 1893.

Eli Whitney, Notary Public.