(No Model.)

3 Sheets—Sheet 1.

B. TOULOUSE & J. DELORIEUX.

APPARATUS FOR CRUSHING, PRESSING, AND CONVEYING FRUIT TO RECEIVING TANKS.

No. 585,800. Patented July 6, 1897.

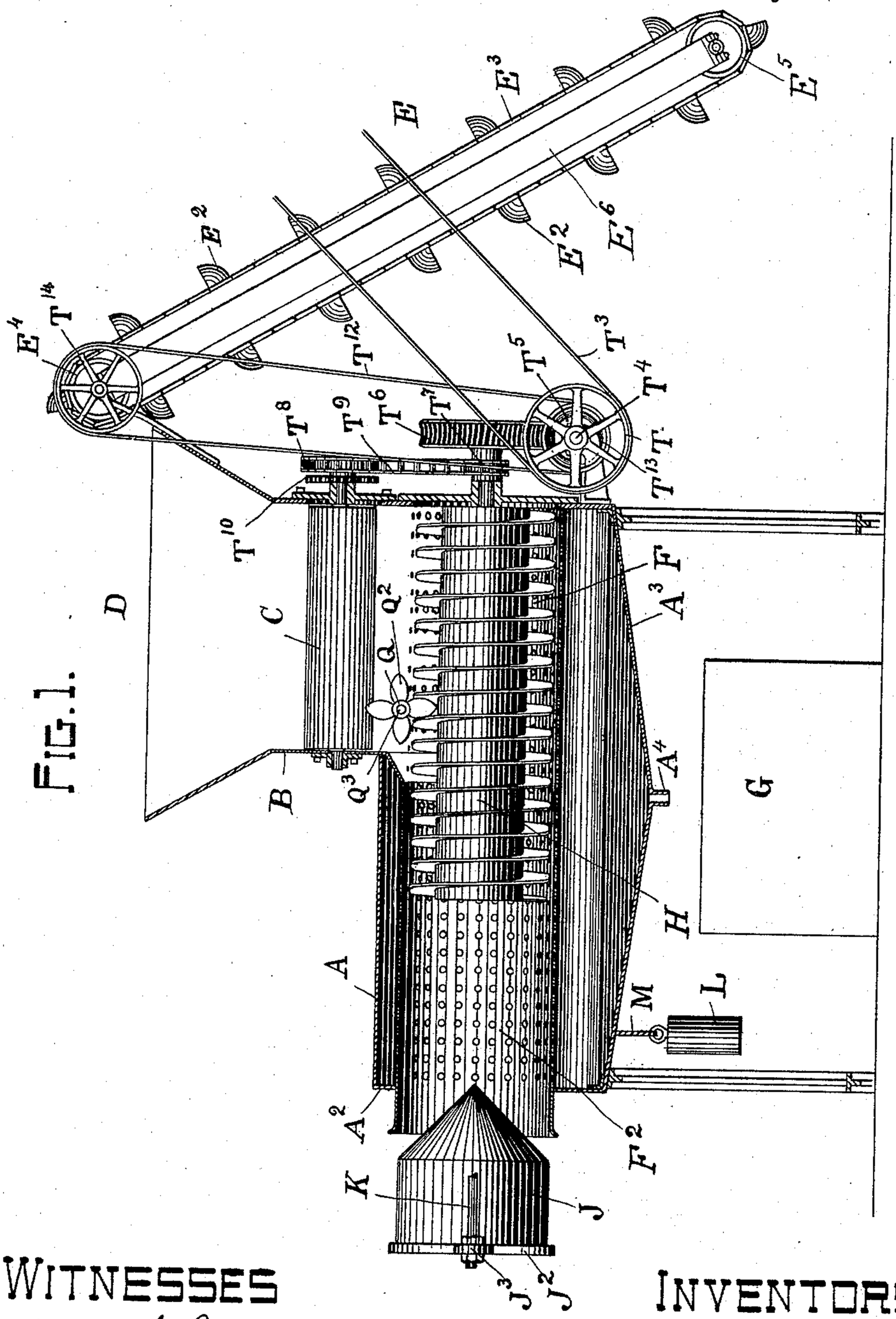

FIG. 1.

WITNESSES

Marcus S. Levé

Fabius T. Finch

INVENTORS

Bernard Toulouse

John Delorieux

by A. H. Ste Marie atty

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FIG. 2.

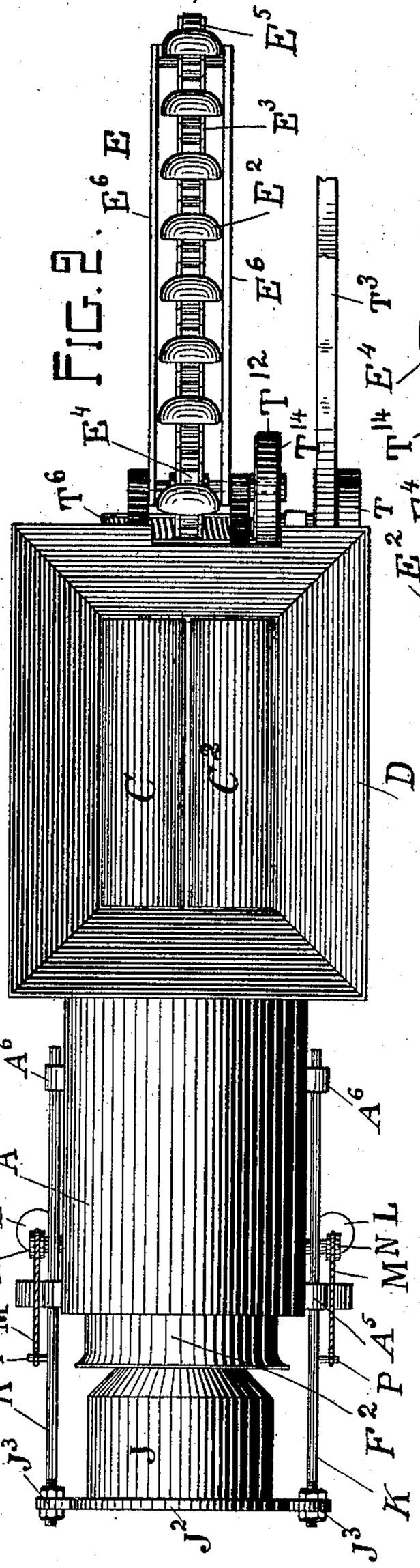

FIG. 3.

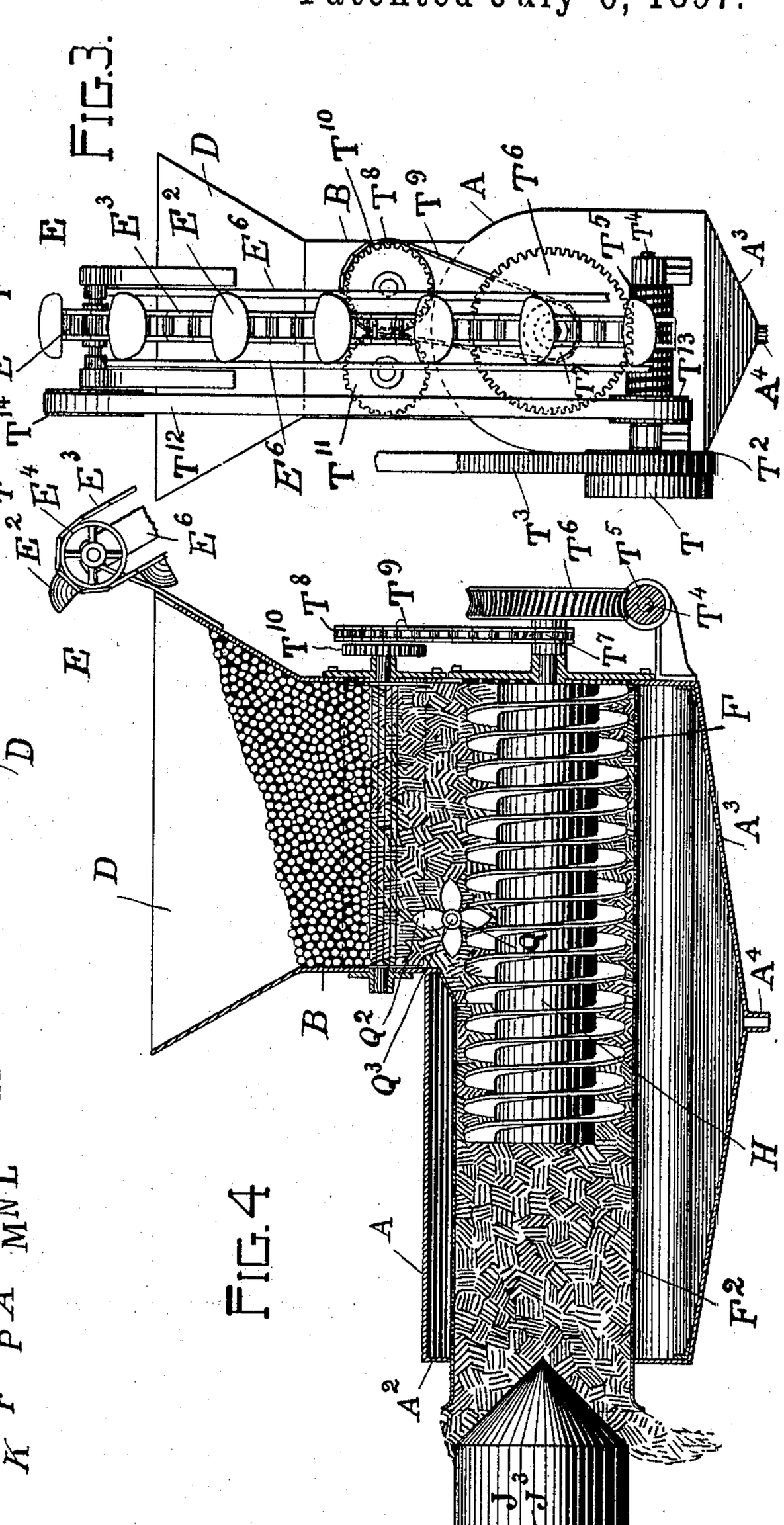

FIG. 4.

WITNESSES

Marcus L. Lewis

Fabius T. Finch

INVENTORS

Bernard Toulouse

John Delorieux

by A. H. Ste. Marie atty

(No Model.) 3 Sheets—Sheet 3.

B. TOULOUSE & J. DELORIEUX.

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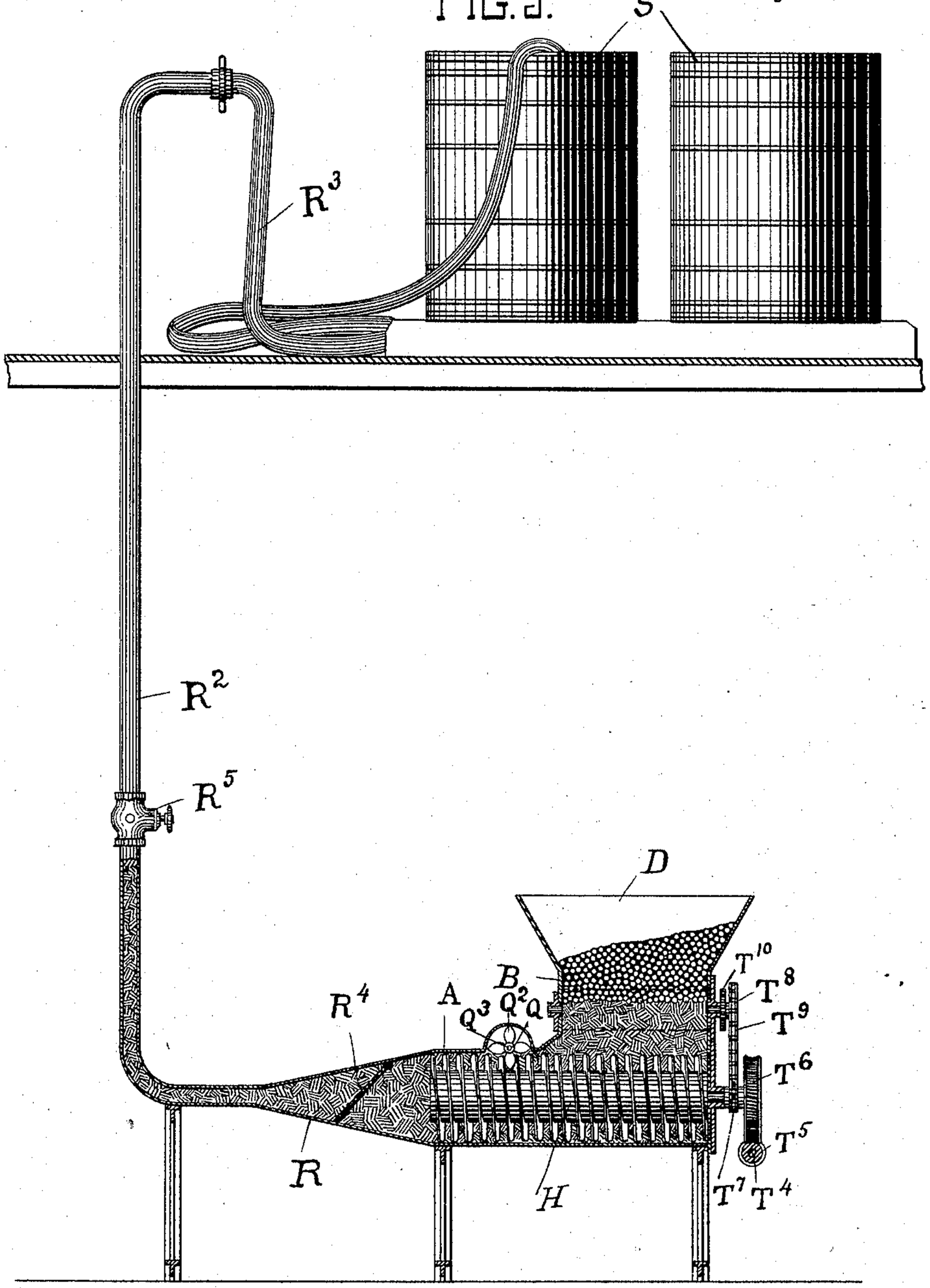
FIG. 5.



WITNESSES

Marcus S. Levee.

Fabius L. Finch

INVENTORS

Bernard Toulouse

John Delorieux

by A. H. Ste Marie atty

UNITED STATES PATENT OFFICE.

BERNARD TOULOUSE AND JOHN DELORIEUX, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR CRUSHING, PRESSING, AND CONVEYING FRUIT TO RECEIVING-TANKS.

SPECIFICATION forming part of Letters Patent No. 585,800, dated July 6, 1897.

Application filed March 5, 1897. Serial No. 626,147. (No model.)

To all whom it may concern:

Be it known that we, BERNARD TOULOUSE and JOHN DELORIEUX, of the city and county of San Francisco, in the State of California, have invented a new and useful Apparatus for Crushing and Pressing Fruit and Conveying it to Receiving-Tanks, of which the following is a specification.

This invention relates to the crushing and pressing of fruit that is used for the manufacture of cider, wine, and other liquors.

The object is to provide a rapid and thorough-working apparatus whose action is direct and continuous and which will do all the work performed by the ordinary crusher, the pump employed therewith, and the screw or hydraulic press, or of all these machines combined.

Referring to the drawings hereunto annexed, which form an integral part hereof, Figure 1 is a sectional elevation illustrating one form of apparatus made according to our invention. Fig. 2 is a top view of the construction shown at Fig. 1. Fig. 3 is a central longitudinal section of the main portion of the apparatus, illustrating its operation. Fig. 4 is an end view. Fig. 5 is a sectional side elevation representing an apparatus of modified form adapted to carry up the fruit which it crushes and discharge the same into receiving-tanks.

In all the figures similar letters refer to corresponding parts.

The letter A designates the body of the apparatus, which consists of a suitable shell preferably made of a number of metal plates that are riveted together and packed to avoid leakage. This shell may be set up in any convenient way. Thus it may be supported on legs of metal or wood, as shown in Figs. 1 and 5, or else it may be placed on a cement or brick foundation, or again it may be mounted on a truck provided with two or more wheels that will allow it to be moved readily from place to place.

The top part of the shell A is open at one end, preferably the right, where it is formed into or provided with a box B, containing a pair of crushing-rollers C C^2 and having a hopper D, into which are thrown the grapes, apples, peaches, berries, or other fruit to be pressed. The fruit is brought to the hopper D by means of an elevator E, resting against it, as shown.

The crushing-rollers aforesaid are journaled in suitable bearings in the ends of the box B, in which they are placed side by side, more or less close to each other, according to the work they are required to perform. They are by preference made of metal and corrugated lengthwise all around, so they will crush the fruit fed to them by the hopper D without breaking or mashing the seeds, pips, stones, pits, or kernels which the fruit contains. The corrugations in said rollers may either be parallel with their axes or they may run in a diagonal direction, as preferred.

The elevator E is made of any desired length and is adjustably connected with the hopper D in such a way that it may be worked at any convenient incline. It is composed, as shown, of a number of buckets E^2, secured transversely of an endless sprocket-chain E^3, passed around sprocket-wheels E^4 E^5, that are journaled in and arranged to turn between the ends of parallel timbers E^6.

F and F^2 designate, respectively, a draining-trough and a compression-tube which may be formed out of one or two hollow cylinders placed centrally and on a level within the shell A, as shown in Figs. 1 and 4. The cylinder or part of cylinder F is suitably supported and held within that part of the shell that opens into the box B, where the crushing-rollers are, and it is itself sufficiently open at its upper part to receive all the crushed fruit that drops from the said rollers. The cylinder or part of cylinder F^2 forms a continuation of the open cylinder or part of cylinder F, whether they are made in one piece or separate, and is supported and held within the other end of the shell, out of which it projects a little, its outer end, which is left imperforate, being fitted within an annular flange A^2, running inwardly from the sides of the shell, as shown. It receives the drained fruit and holds it for compression, as described hereinafter. Both the trough F and the tube F^2 are made of brass or copper and are both perforated throughout, so that the juice of the fruit passing through them may readily escape and run or drip into a basin

A^3, formed in the lower part of the apparatus, whence it flows through one or more spouts A^4 into one or more buckets, tubs, or similar vessels G, adapted to receive it. The basin A^3, it will be understood, may be given a different shape from that represented in the drawings, and its bottom may be inclined, so as to lead the juice in any desired direction or in different directions without departing from the principle of our invention.

The pressing of the fruit is effected in the compression-tube F^2 aforesaid by means of a screw H, acting in conjunction with a stopper J. The screw H works on the same principle as an Archimedean screw applied to the compression of solid substances, and it consists of a spiral blade wrapped around a suitable stem, cylinder, or core and arranged to revolve partly in the trough F and partly in the tube F^2, in which the said screw is laid in a horizontal position with its stem parallel with their common axis. It is journaled in the right end of the shell A and is made to extend the entire length of the draining-trough, but not the full length of the compression-tube, an empty space being left between the last convolution of the screw-blade and the inner end of the stopper J, as shown. It is in this space that the pressing of the fruit takes place. The stopper J, above referred to as working jointly with the screw H, consists of a body of suitable shape to close the outer end of the tube F^2 and prevent the escape therefrom, up to a certain predetermined pressure, of the fruit driven toward it by the screw. This stopper may be made of metal or wood and either solid or hollow, as preferred. Its shape also may be varied, though we believe the form illustrated in Figs. 1, 2, and 4 is the best to give it. As shown in these figures, it is made in the shape of a cone having a cylindrical base, the cone portion being pointed toward the axis of the driving or pressing screw H and the base fashioned to enter and fit the imperforate end of the compression-tube F^2. A flange J^2, extending laterally from the base of the stopper and adapted to bear on the end of the tube F^2, prevents the former from being driven too far in the latter. The stopper is maintained in position and guided in and out of the compression-tube by parallel rods K, secured in lugs J^3, on opposite sides of its flange J^2, and arranged to slide through similar lugs A^5 A^6, disposed in pairs and in line on the corresponding sides of the shell A. Weights L, attached to ropes or chains M, passing over guide-pulleys N and fastened to pins P, projected from the guide-rods K, normally keep the conical end of the stopper inside the compression-tube and cause it to exert upon the fruit therein a set pressure that is uniform throughout. These weights may vary in size, according to the pressure which it is desired to obtain. Several such weights or sections thereof may also be attached to each rope or chain.

Q indicates a wheel or disk carrying blades, paddles, or scoops Q^2 around its periphery, which are arranged to mesh with the spiral blade of the screw H, straddling it and moving across it as the screw is being turned. This wheel or disk may either be loose on its spindle Q^3, or it may be rigidly secured to the spindle and the latter arranged to rotate with it, as preferred. It is placed at or near the point where the compression-tube joins the draining-trough in the central upper portion of the shell A. Its upper part may be boxed up, for example, in the manner represented at Fig. 5, if found necessary or desirable. The object of it is to avoid the choking up of the press or its stoppage by preventing the fruit from getting packed about the screw and turning round with it without advancing.

Fig. 5 represents an apparatus the construction of which is based upon the same principle as that above described, but embodying a somewhat different combination of parts. Like the apparatus shown in the other figures, this one has an outer shell A, mounted on suitable supports; a box B in the top thereof, which incloses crushing-rollers C C^2; a hopper D, adapted to receive the fruit from an elevator or otherwise; a driving-screw H, located below and receiving the fruit from the crushing-rollers, and a rotary disk or wheel Q, having blades, paddles, or scoops Q^2 and mounted on a spindle Q^3 crosswise of the shell A, so its blades, paddles, or scoops will be engaged successively by the thread of the screw when the latter is turned. This apparatus has not got, however, the draining-trough, compression-tube, and stopper of the other. Instead it is provided with a tapering or funnel-shaped discharge-tube R, that is suitably supported from its left end and connects with a vertical pipe R^2, adapted, with rubber hose R^3, coupled therewith, to convey the crushed fruit to receiving tanks or vats S, located on a floor above. A gate or valve R^4 of suitable shape is fitted so as to work in the tube R and prevent backflow from the pipe R^2. A stop-cock R^5 is placed in the pipe R^2 for a similar purpose.

Our improved apparatus above described is adapted to be run by any suitable motive force—such as steam, gas or gasolene, water, electricity, animal power, &c. There are so many forms of engines and motors that can be employed for working it and these are so well and commonly known that we have deemed it best not to show any in the drawings hereto annexed. As to the power-transmitting mechanism and gearing, this can also be varied to a great extent. We believe, however, the following-described power connections well adapted to operate our apparatus. Loose and fast pulleys T T^2, either of which will take a power-transmitting belt T^3, are placed on one end of a shaft T^4, journaled in suitable bearings across the lower right end of the shell A. This shaft carries a worm T^5, gearing with a worm-wheel T^6,

that is keyed to the spindle of the screw H, which is journaled in the end wall of the shell, as previously described. The above-enumerated parts operate to drive the screw H and cause it to revolve and at the same time rotate the disk or wheel Q, that meshes into it. From the worm-wheel power is also transmitted to the crushing-rollers C C^2 above the screw through the medium of a sprocket-wheel T^7, carried by the hub of said worm-wheel, a second sprocket-wheel T^8, secured to the spindle of one of said rollers, a sprocket-chain T^9, passed over both these sprocket-wheels, and intermeshing cog-wheels T^{10} T^{11}, fastened, respectively, to the spindle of each crushing-roller. This part of the gearing operates to run the crushing-rollers in opposite directions and causes them to draw and crush between them the fruit that is brought into the hopper. The elevator that brings the fruit is run by means of a belt T^{12}, passing over pulleys T^{13} T^{14}, one of which is carried by the shaft T^4 and the other of which is secured to the axle of the elevator's upper sprocket-wheel E^4.

The operation is as follows: When the fruit is such that all its juice may be extracted at one operation—for instance, in the case of apples, from which cider is made, or in the case of white grapes, used for making wine—the apparatus is then arranged to work as illustrated in Figs. 1 to 4, the stopper J being pushed well in the tube F^2 and the weights L, that hold it in place, being adjusted so it will before it can be moved out offer to the fruit driven by the screw H a resistance sufficient to cause the liquid portion of the same to free itself from the other parts and leave them in a dry state. The actuating mechanism being set in motion, the fruit will be brought up by the elevator E and unloaded into the hopper D upon the rollers C C^2, as represented in Fig. 4. These rollers will immediately draw down the fruit and crush it between them, so as to disintegrate and mash it, and in that condition will let it fall unto the screw H and down into the trough F, containing said screw. This preliminary crushing prepares the fruit well for the pressing and is intended to take the place of the treading or trampling under foot still indulged in in certain quarters by users of the common presses. It also does away with the crushing apart or outside of the press, so that a separate crusher is no longer requisite and there is no necessity to handle the fruit twice, as occurs when it is first passed through a separate crusher and thence removed to the press. While the fruit drops down it will be observed that the juice liberated from it during the operation of crushing is drained off by the trough F, escaping through the perforations or open spaces in the sides of the latter and thence running down into the basin A^3, that lies underneath, from which place it flows through the spout A^4 into the vessel G. The mashed pulp, skins, seeds, stems, and other matter left in the draining-trough are in the meantime caught by the spiral blade of the screw and driven forward and outward into the compression-tube F^2, where they accumulate and run against the stopper J, that closes this tube. As all this matter gathers in the tube under the powerful impulse of the screw it becomes more and more packed against the stopper and the sides of the tube until there is exerted on it a pressure sufficient to offset that of the weights L, that keep the stopper in place. In the meanwhile any juice that may have remained in the fruit passed through the draining-trough is squeezed out and expelled through the perforations or open spaces provided in the sides of the compression-tube. The pressure is gradual and exerted in the best possible manner, increasing as layer after layer of fruit is pushed forward by the screw, so that the juice has time to escape and is all extracted before the pressure on the fruit inside the tube is strong enough to overcome the resistance of the weighted stopper outside and force it out. When the inside pressure becomes greater than the resistance offered outside, then the juice is all expressed, and the remaining matter, now dry and hard, forces its way out past the stopper—that is to say, the pomace in the case of apples, or the marc in the case of grapes, or the residue of any fruit that is being pressed. As the tube is cleared of this matter the pressure in it is of course proportionately diminished, and the stopper, pulled back by the weights, automatically returns to its place, where it stays until forced out again by an increased pressure of the matter subjected to the action of the screw. The apparatus thus automatically clears itself, and the operation of crushing and pressing may be carried on continuously without a single moment's interruption.

Red or black grapes that are used in the manufacture of white wines are passed and treated in the apparatus the same as white grapes, being crushed and pressed at one operation in the manner aforesaid. Although thorough, the pressing is done so rapidly that it is believed the juice of red or black grapes will remain clear and unstained by their skins or other matter if they are subjected to the same pressure as the whites. Still if particularly light wines are desired, and one is afraid the juice would become colored during a hard pressing, the red or black grapes may well be subjected to a lesser pressure at first, the weights of the stopper in that case being reduced to suit. A second pressing would then be required to secure the remainder of the juice. The same end could be gained by making provision for the separation of the juices coming from the draining-trough and from the compression-tube, in which case the pressing could be as hard as for white grapes and effected at one operation. All this we claim falls within the scope of our invention.

The apparatus is operated somewhat differently in the manufacture of red wines, for the making of which the must or grape-juice has to be fermented on the skins, so it will take some of the coloring-matter which they contain. The crushing and pressing of the grapes must then be done at separate intervals. In such case the draining-trough, compression-tube, and stopper are not used at first, no pressing being done except by the crusher, and the apparatus is arranged to work as shown in Fig. 5. The screw H can then be utilized for carrying up the crushed grapes into fermenting-tanks, as represented in this last figure, and the pumps or other raising apparatus usually employed for this purpose can be dispensed with. The whole fruit, as it is dropped from the rollers, skins, stems, mashed pulp, seeds, and all, is transferred from the apparatus to the tanks by the screw. When this has settled and remained in the tanks long enough, the must or liquid portion is racked off and the marc or residue is then transferred back to the apparatus for pressing. The pressing is done as previously described, with the apparatus arranged as in Figs. 1 to 4, save that the crushing-rollers need not be used and are taken off or put apart.

The preliminary crushing and raising into tanks, as accomplished by the apparatus in Fig. 5, can as well be performed, it will be observed, by the apparatus shown in the other figures. The only thing required to adapt the latter-named apparatus to perform such work would be to have the inner cylinder imperforate, remove the stopper, and attach the discharge tube and pipe. Such a change would require no invention and is within our claims. If we have illustrated a modified or different construction at Fig. 5, it is because we wish to show that our invention may take several forms all embodying the same principle.

Another change which might be made in our invention without departing from the principle thereof would be to add a stemmer to the crushing-rollers. Wine-makers do not all press their grapes in the manner above described—that is, not without first removing the stems. Any mechanic will readily understand how a stemmer, of which there are several forms, can be connected with the crushing part of the apparatus, and it requires no invention to apply such stemmer. If we have not represented a stemmer in connection with our apparatus, it is because we want to show that our apparatus is made for crushing and pressing all sorts of fruit in general, and not simply one kind in particular.

Having described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus of the character described, a screw, a perforated cylinder in which it revolves, and means at the end of the cylinder for retarding the discharge of the pulp, combined with a revolving device, moving at right angles to the length of the screw, and provided with arms, for catching between the threads of the screw, and preventing the pulp from becoming packed between the blades of the screw, substantially as shown.

2. An apparatus of the character described comprising a crusher, a partly-open perforated cylinder thereunder, a driving or pressing screw in said cylinder, a wheel or disk having blades, paddles, or scoops meshing into the thread of said screw, a stopper adapted to exert a uniform pressure oppositely to the screw, and actuating mechanism, substantially as set forth.

3. In an apparatus of the character described, a driving-shaft, provided with a pulley upon one end, and having a thread upon its surface, a belt passing around the pulley and conveying motion to the shaft, a worm-wheel which engages with the thread upon the shaft, and a screw which is operated by said worm-wheel, combined with a sprocket-chain which is operated by a pinion upon the shaft of said screw, crushing-rollers operated by said chain, a hopper, in which the crushing-rollers are placed, a perforated cylinder in which the screw revolves, means for retarding the discharge of the pulp, means for catching the juice which is expelled from the pulp, and a revolving device provided with arms which catch between the blades of the screw and which device is made to revolve in a longitudinal line with the screw, substantially as set forth.

4. In an apparatus of the character described, a revolving screw, a perforated cylinder in which the screw revolves, and means for preventing the pulp from packing between the blades of the screw, combined with the inclosing shell which surrounds the perforated portion of the cylinder, means for retarding the discharge of the pulp from the cylinder, and a pan A^4 placed below the perforated cylinder to catch the juice, substantially as specified.

5. An apparatus of the character described comprising a suitably-supported perforated cylinder, a basin provided with one or more spouts thereunder, a driving or pressing screw arranged to revolve in said cylinder, a crusher discharging unto said screw, a yieldingly-supported stopper exerting a uniform set pressure in opposition to the screw, and means for clearing the screw as it revolves and preventing stoppages, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

BERNARD TOULOUSE. [L. S.]
JOHN DELORIEUX. [L. S.]

Witnesses:
A. H. STE. MARIE,
CHAS. T. STANLEY.