

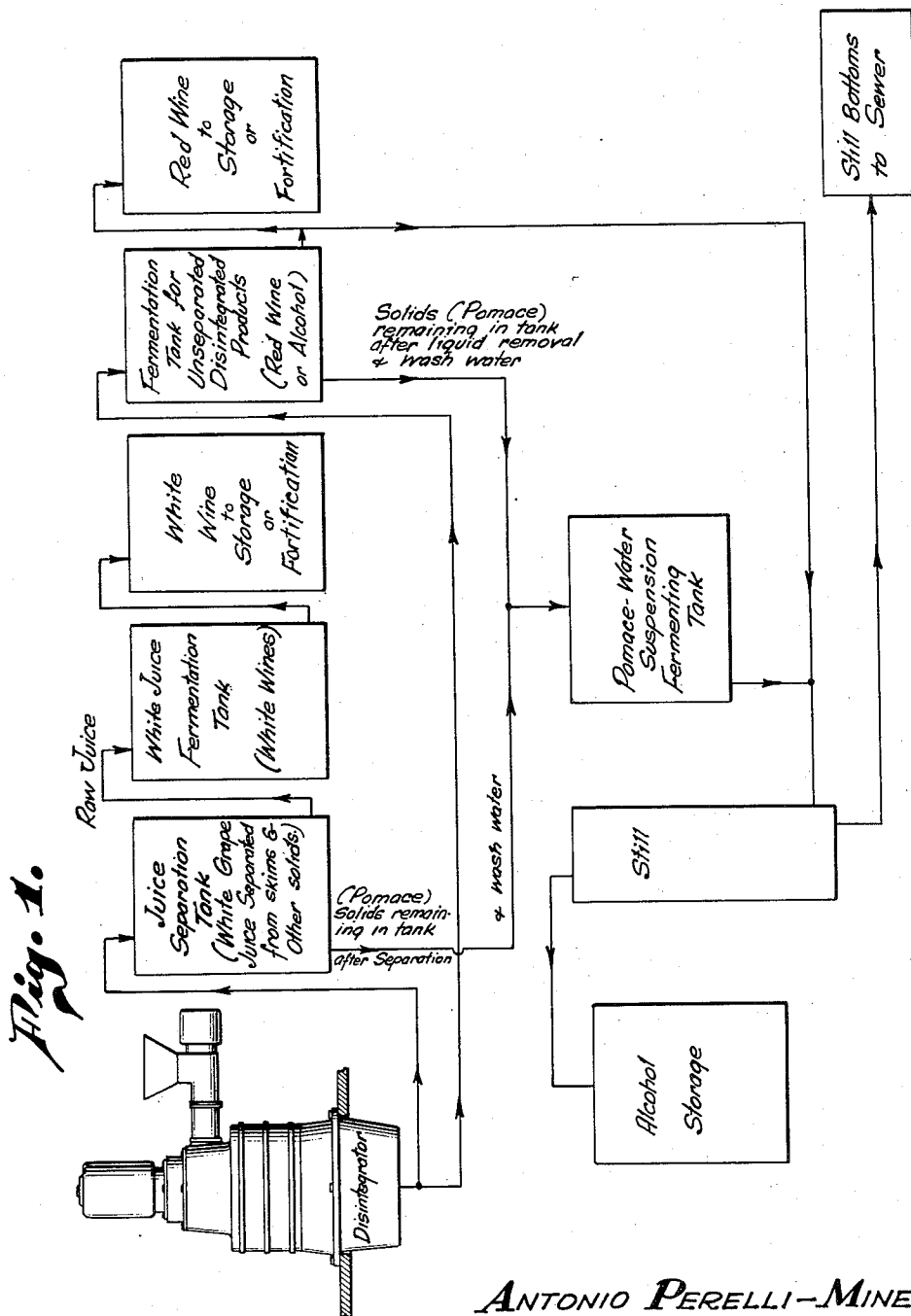
Sept. 16, 1958

A. PERELLI-MINETTI
SIMPLIFIED METHOD FOR PROCESSING GRAPES
INTO JUICE AND FOR FERMENTATION

2,852,387

Filed Dec. 13, 1952

2 Sheets-Sheet 1



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Fig. 2.

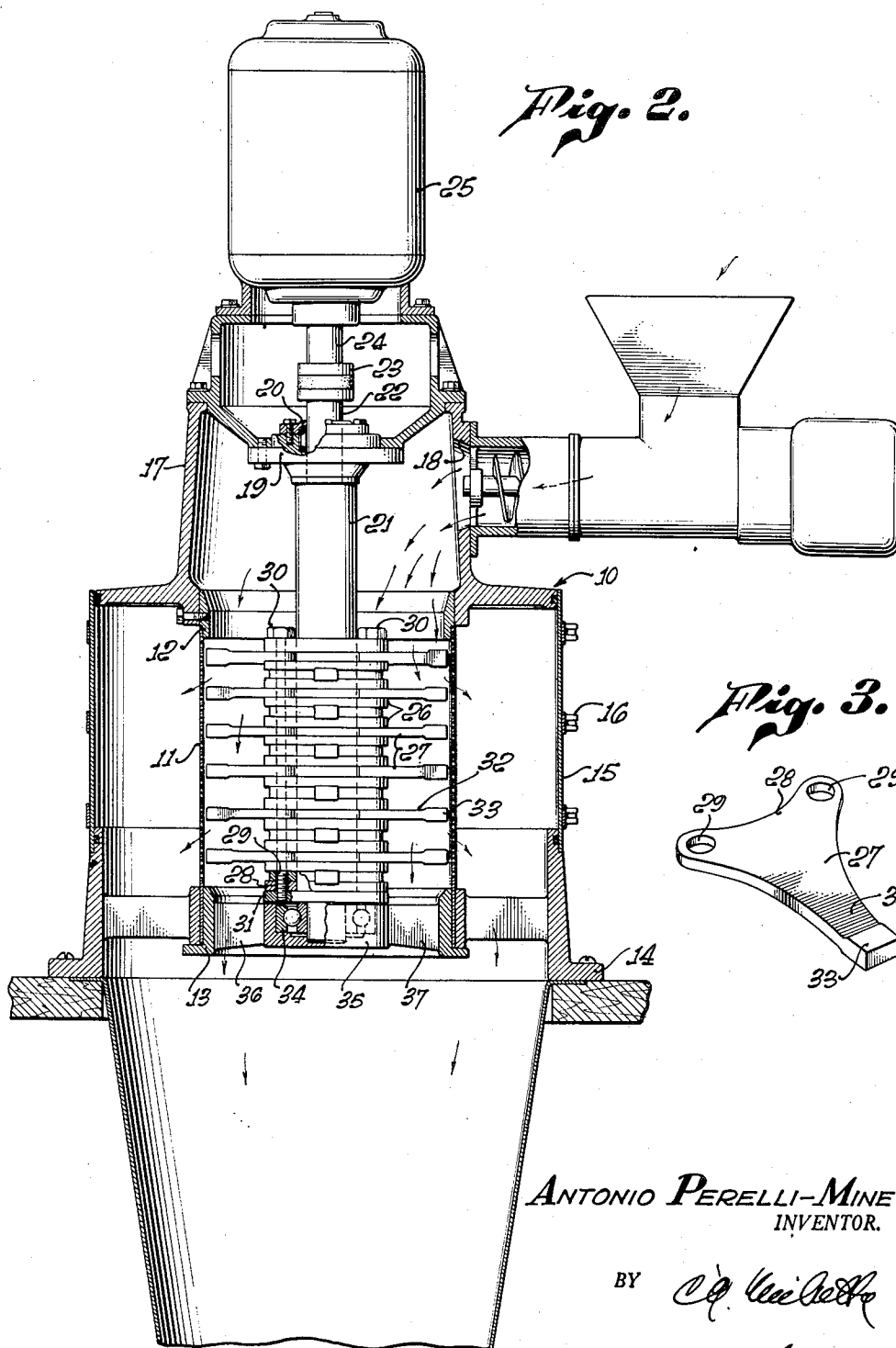
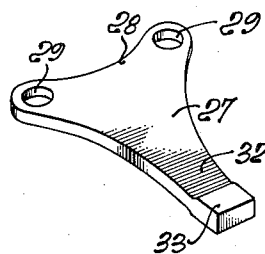


Fig. 3.



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SIMPLIFIED METHOD FOR PROCESSING GRAPES INTO JUICE AND FOR FERMENTATION

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2 Claims. (Cl. 99—35)

This invention relates to an improved process for the treatment of grapes to insure substantially total recovery of the sugar and related products contained by the grapes.

The principal object of this invention is to provide a process whereby the grapes delivered to the winery are completely disintegrated in a single operation thereby insuring the substantially total recovery of the sugars present in the grapes, as well as the related products normally derived from grapes.

Another object of this invention is to make available a process that simplifies the operation of a winery by eliminating several steps heretofore employed in the process of wine making, thereby reducing the labor, time and equipment ordinarily required in the processing of grapes into wines or related products. My process materially reduces waste and results in lower production cost. The term grapes is intended to designate the grapes in the condition in which they are received at the winery which usually includes the bunches of grape berries attached and detached to the stems as well as the raisins or partially dried berries.

Heretofore, grapes have been processed for juice, wines and other related products by crushing the grapes in a so-called grape crusher. The operation of the customary grape crusher involves considerable waste of sugars, due to the fact that the stems of the grapes are separated from the berries by the crusher, and since the berries are partly broken at this stage and since the destemming operation usually throws out an appreciable amount of pulp as well as an appreciable amount of the juice which is adhering to the stems; some juice and pulp are discharged from the crusher with the stems. The stems are generally washed after leaving the crusher in an attempt to recover a portion of the sugars that would otherwise be lost. However, even this operation does not recover all of the sugar. The crusher also discharges a substantial quantity of skins, and the major portion of the raisins or partially dried grape berries. It is readily apparent that in the crushing type of operation ordinarily employed, an appreciable quantity of sugar is lost.

According to my invention, I eliminate entirely the grape crusher heretofore employed with all of its disadvantages. I accomplish this by subjecting the grapes to a total disintegration that takes place in a single operation. By this total disintegration, the stems, skins, berries and seeds as well as the raisins or partially dried grape berries are completely disintegrated into a predominantly liquid mixture containing all of the sugar in the grapes.

The advantages of my invention employing total disintegration over the customary method of processing grapes are:

(1) Substantially all of the sugar content of the grape is recovered, thus increasing the yield of products per ton of grapes.

(2) A single operation is required to substantially completely disintegrate the whole grapes, thereby eliminating

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many of the steps heretofore required. The stems are shredded in this single operation into fine, short filaments, thereby eliminating the necessity of discharging the stems from the crusher with some pulp and juice usually adhering to the stems, and subsequently processing the stems to attempt the recovery of the adhering juices. The labor necessary to remove, wash and haul away the washed stems is likewise eliminated.

(3) A material saving of time, man power and equipment is effected, making possible a lower production cost.

(4) The sugars of the raisins or the partially dried grape berries are substantially recovered since the single stage total disintegration process likewise breaks the raisins and partially dried grapes into finely divided particles.

(5) Since the skins are broken into finely divided particles during the total disintegration of the grapes, any juices, pulp or sugars are recovered before ultimate disposal of the skin residues as has been heretofore the case.

The major portion of the color content of dark colored grapes is contained in cells located in the skins. Since the skins are broken into minute particles by the total disintegration, the color-containing cells are to a great extent also ruptured and better contact is assured with the juice and the carbonic acid (a leaching medium) during the fermentation stages, thus naturally increasing the color imparted to red wines.

Total disintegration besides breaking down the skins into small particles and shredding the stems into small filaments breaks the seeds into fine particles and substantially liquefies the pulp. The solid components of the grapes are discharged from the disintegrator as a fluffy mass.

This fluffy mass and juice is then placed into receiving tanks either for fermentation or draining of the juice. The broken skins, seeds and shredded filaments produce a mass of higher capillarity that will permit immediate drainage of the fresh juice if such is desired, as is the case when white grapes are processed for wine. It has generally been the practice in the trade to ferment white juices without grape skins present.

In the case of dark colored grapes where greater color is desired in the final products, the liquefied mass from the disintegrator is subjected to partial or total fermentation and the fluffy mass consisting of the juice and solid components of the grapes in finely divided state will be rotated, without the use of additional equipment, by the action of the rising gases developed during fermentation. This will result in a great saving in labor, time and equipment normally required to circulate the juices over the so-called cap collecting above the juice in an attempt to extract all of the beneficial components as is generally necessary in the processes heretofore used. This automatic rotating action of the fluffy mass increases the color in red wines.

The total disintegration of the grapes also results in trapping a greater quantity of air in the form of fine bubbles into the liquefied mass, thereby permitting easier separation of the liquids from the fluffy solid particles. The general practice when grape juice is to be obtained in a fresh or nearly fresh state by the customary process is to separate the juice by mechanical means or to allow fermentation to start in order to form a packed cap on top of the juice which will not revolve by itself and thus permit drainage of the juice. This process normally requires one or more days. In the present process, where the grapes are totally disintegrated, drainage of the juice may be effected, if desired, within the day and even while the tank is being filled. Consequently, this increases

the turn-over of the receiving tanks and also contributes greatly to saving in man power and equipment.

Heretofore to facilitate the removal of the undisintegrated grape pomace from the receiving or fermenting tanks after the juice has been drained, it has been customary to build receiving tanks with steeply sloping bottoms. Generally, in the customary procedure, a large quantity of water is required to wash out the resulting solid mass that settles at the bottom of the tank after the juice has been drained. The result of this is that the alcohol content of the wash (pomace plus water) which normally constitutes the distilling material, is very low in sugar and/or alcohol and therefore it becomes necessary to recirculate some of the wash over unwashed pomace until the alcohol and/or sugar content of the wash is raised to an economical point for distillation after fermentation. In the process of complete disintegration, the repeated use of the wash is not necessary since the residual pomace formed is light and fluffy and a lesser amount of water is required to wash out the residue from the tanks. The result is that the amount of water used can be controlled to form a fully fermented water-alcohol mixture that can be economically distilled without the former necessity of repeatedly using the wash over unwashed pomace to raise the alcohol content.

The time required to wash out the pomace from a 24,000 gallon flat bottom tank where total disintegration is employed, is about one half hour and is accomplished by one man. The cleaning of a correspondingly sized tank with a sloping bottom in the customary process where the pomace is not disintegrated requires a great deal more time and man power. Here again the total disintegration process results in a material saving in man power, time and avoids the necessity of repeated washing operations.

In the former process where it is the practice to press the pomace after it has been washed several times, in an attempt to recover the sugar and alcohol contained therein. The pressed pomace, however, retains considerable moisture and a certain percentage of sugars and/or alcohol as the case may be, that is dissolved in this liquid will be discarded with the pressed pomace.

The raisins or partially dried grape berries have also heretofore, generally constituted a total loss when the pomace is pressed. In fact, the presence of dried or semi-dry grape berries has increased the loss of sugar due to the fact that during the contact of these berries with the juice, they swell and absorb juice and in many cases, the press fails to break them up. As a result, the berries with the absorbed juice are discarded with the pressed pomace and wasted. The total disintegration process, on the other hand, eliminates such losses.

In the process of total disintegration the juices and wines will likewise contain a greater quantity of tannic and other acids that are present in the grapes due to the fact that these are rendered more easily soluble in the juices by the fine disintegration of the solid portions. Therefore, the wines obtained by my total disintegration process are more stable and will possess a more fruity taste that more closely resembles the flavor of the grapes from which they are produced. The tannins released by the stems and seeds likewise assist in clarification of the wine.

The above process will be better understood with reference to the accompanying drawings in which:

Fig. 1 is a flow diagram showing the process that takes place from the time the grapes are delivered to the disintegrator until they leave the receiving or fermenting tanks.

Fig. 2 is a sectional view on a plane passing through the longitudinal axis of one type of disintegrating apparatus suitable in carrying out my invention.

Fig. 3 is an isometric view of one of the hammers used in the disintegrator.

Reference to the flow diagram will more clearly emphasize all of the material improvements effected by my process.

ess. The flow chart shown in Fig. 1 represents the process which has been developed and adopted when employing total disintegration in a single operation. In the process, the grapes in the form in which they are received at the winery are conveyed to the disintegrator and complete disintegration is effected. The disintegrated mass is pumped to fermenting or receiving tanks where the disintegrated black grapes are allowed to ferment either partially or totally as desired. The juice from the disintegrated white grapes is drained immediately if so desired and this draining can take place while the tanks are filling since the tanks are equipped with special draining man holes located at one side near the bottom. The white juice is transferred to another tank in which it may be fermented.

After the tanks are drained of juice or wine, the residues are washed out of the tanks with a controlled amount of water and this liquid mixture is pumped into the distilling material tanks where it is allowed to undergo additional fermentation.

When fermentation of this liquid-solid mixture has completed, the distilling material is pumped into a continuous still and the alcohol removed therefrom. The wastes from the still, commonly designated as slops, are discharged into sewers or sumps, as the case may be, for final disposition.

One type of disintegrator employed in my process is manufactured by the Rietz Manufacturing Company of Santa Rosa, California. This device is merely shown by way of example and it is not intended to limit the invention to the use of this particular device since any other disintegrator type of mechanism capable of totally disintegrating the grapes can be substituted.

Fig. 2 shows one form of disintegrator comprising a housing 10 that supports a perforated cylindrical screen or plurality of perforated cylindrical screens 11, usually in the form of two semicircular shells joined together, and supported by means of supporting rings 12 and 13. The housing is mounted on a suitable platform by means of flanges 14. The housing is also provided with removable side panels 15 that are held in place by quick-opening clamps 16 to permit rapid cleaning and maintenance of the inner portions of the device.

The upper portion of the disintegrator 17 which forms a part of the housing 10 is smaller in diameter than the principal portion of the housing but is slightly larger in diameter than the diameter of the screen supporting ring 12, is known as the accumulator section. This section is provided with an opening 18 into which the products to be disintegrated are delivered. To the upper end of the accumulator section 17 there is attached a bearing support 19 that houses upper bearing 20. Bearing 20 is supported on a shaft 21 by a shoulder formed by reducing the diameter of the shaft near its upper end. The main portion of the shaft is made sufficiently large in diameter to insure vibration-free operation. The shaft continues at reduced diameter to its upper end forming a short cylindrical section 22 above the bearing. The end of section 22 is connected to one portion of a coupling member 23. The corresponding portion of the coupling member is connected to the shaft 24 of a driving device 25 such as an electric motor, internal combustion engine or other form of motive power.

A rotor assembly comprising a plurality of alternating discs 26 and so-called hammers 27 is mounted on shaft 21 and extends substantially the full vertical height of the perforated screens 11. Each disc 26 is provided with a plurality of uniformly spaced holes 28, usually four in number. The hammers 27 project from individual bases 29 in the form of a segment of an annulus that is sufficiently long to span two adjacent holes 28 in the discs and accommodate corresponding holes 29 in the bases. The hammers and discs are all held together by means of a plurality of bolts 30 that pass through the holes in the discs and the corresponding holes in the base of the ham-

mers and bind the entire rotor assembly together by threading or bolting against a plate 31 attached to shaft 21 near the lower end thereof. Two hammers are placed between each pair of discs and are diametrically opposed to each other. Each alternate pair of hammers is preferably positioned so that they are rotated 90° from the hammers of the pair immediately above and below them. The projecting portions 32 of each hammer extend radially towards the screen or screens 11 and the end of each projecting portion 32 is enlarged to form an anvil-like head 33. The side of the anvil-like head facing the screen forms a small clearance between the inner surface of the perforated screens and the end of the hammer.

The lower end of the shaft is reduced in diameter for a short distance and is provided with a second bearing 34 that rests against the shoulder formed by this reduced diameter. This bearing is housed in a bearing support 35 that attaches to the lower end of the housing 10 by suitable flanges 36 and 37 and protects the bearing proper from the juices and other liquids that may travel down the shaft.

The space between the screen 11 and the removable side panels 15 is proportioned to permit easy passage of all of the products disintegrated by the hammers escaping through the perforations in the screen. The perforations in the screen may be of any desired size and shape, however for the purposes of my invention, the preferred type of screen perforations is circular and varies between $\frac{1}{16}$ " and $\frac{1}{4}$ " in diameter. If desired, more than one screen may be used in which case the additional screen is referred to as a backing-up screen. This screen may also utilize perforations of any desired size or shape. The preferred backing-up screen is usually provided with larger openings than the principal screen.

The manner in which the device operates is as follows: The grapes in the condition delivered to the winery are dumped into a hopper and conveyed to the disintegrator and discharged into accumulator section 17 where they fall into the revolving rotor. The revolving hammers 27 break the grapes into liquid and finely divided solid particles as the mass travels down the disintegrator rotor. The hammers and rotor portion of the assembly revolve at approximately 3600 R. P. M. and all the products fed through the accumulator section are subjected to the action of the rapidly rotating hammers coupled with centrifugal force which disintegrate all of the pulp into liquid, convert the skins, seeds and leaves that pass through the rotor into a mass of fluffy, finely divided solid particles. The stems are also broken up by the hammers and centrifugal force into short filaments that enhance the capillarity of the solid mass and permit the solid particles to readily mix with the juices. The solids are discharged along with the juices through the holes in the screen and from the bottom of the disintegrator rotor. The disintegrated mass is pumped into its proper receiving tank.

The particular advantage of my process of total disintegration by a single operation is that there is a substantially total recovery of the sugars in the grapes, and therefore the yield per ton of grapes is increased.

A further advantage of my process is that a number of the steps generally employed in the customary manner of operating a winery are eliminated, thereby effecting a material saving in labor, time and equipment, thereby materially reducing producing costs.

Another advantage of my process is that because of the fluffiness of the pomace, a natural rolling action will take place when the gases rise during fermentation. This form of agitation prevents the formation of a compact cap and thus makes it possible to dissipate more heat and expel more carbonic acid in the form of carbon-dioxide, thereby making possible more uniform fermenting conditions throughout the tank. This automatic agitation due to the rising carbonic acid and the escape of air particles entrapped in the products by the disinte-

gration process also permit the escape of a greater quantity of heat generated by the fermentation process and minimizes the danger of lactic fermentation. The natural agitation resulting in the aeration of the fermenting mass and loss of heat and carbonic acid also reduces the need for refrigeration or cooling. This factor constitutes a substantial saving of energy and cost.

Because of the total disintegration of the grape pulp, seeds, stems and skins, a greater recovery of juice is permitted and this, in the case of varietal grapes for the production of varietal wines which have to be certified, is of particularly great importance.

Minor modifications and changes from those set forth in the invention herein described will occur to those skilled in the art. All such modification and changes not departing from the spirit of the invention are intended to be embraced within the scope of the appended claims.

I claim:

1. A simplified method for processing grapes into wine and related fermentation products, in the form in which said grapes are received at the winery which comprises: simultaneously disintegrating the pulp, skin, seeds and stems in a single operation, said disintegration converting said pulp substantially into a liquid, shredding the stems into short filaments of smaller diameter than the diameter of the original stems, and breaking said seeds and skins into finely divided particles, thereby rupturing the skin cells, entrapping air in the substantially liquid mass during said disintegration, thereby forming a substantially liquid suspension of juice and solids in which the finely divided solid particles and filaments are lower in density than the density of said juice, thereby permitting rapid separation of the juice therefrom, transferring said substantially liquid suspension to a first receiver wherein said solids separate from said juice in the form of a porous fluffy mass that collects on the surface of said juice; fermenting the sugars in said receiver to the desired alcoholic concentration, thereby generating carbonic acid, gases, and heat, said gases and heat rising to the surface of said juice; continuously agitating said fluffy mass by means of the action of the rising gas bubbles, thereby preventing said fluffy solid mass from forming a packed cap and insuring free passage of gases and heat through said fluffy solid mass whereby gases and heat of fermentation escape from the fermenting mixture, heat is more freely dissipated, thereby reducing the danger of lactic fermentation as well as reducing materially the amount of heat to be abstracted from said fermenting mixture; withdrawing the fermented liquid from said fluffy solid mass; adding water to the residual fluffy mass forming an aqueous suspension of said solids and dissolving substantially all sugars and alcohol contained in said fluffy solid mass; transferring the aqueous suspension and dissolved sugars and alcohol to a second receiver; fermenting the sugar contained in the aqueous suspension until conversion of sugars into alcohol is substantially complete and distilling the alcohol from said solid suspension.

2. A simplified method for processing dark colored grapes into wine and related fermentation products, in the form in which said grapes are received at the winery which comprises: simultaneously disintegrating the pulp, skin, seeds and stems in a single operation, said disintegration converting said pulp substantially into a liquid, shredding the stems into short filaments of smaller diameter than the diameter of the original stems, and breaking said skins into finely divided particles, thereby rupturing the skin cells and releasing a greater proportion of the coloring matter therein; entrapping air in the substantially liquid mass during said disintegration, thereby forming a substantially liquid suspension of juice and solids in which the finely divided solid particles and filaments are lower in density than the density of said juice, thereby permitting rapid separation of the juice from the solids; transferring said substantially liquid suspension to

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a first receiver wherein said solids separate from said juice in the form of a porous fluffy mass that collects on the surface of said juice; fermenting the sugars in said receiver to the desired alcoholic concentration, thereby generating carbonic acid, gases, and heat, said gases and heat arising to the surface of said juice; continuously agitating the fermenting mass by means of the action of the rising gas bubbles, thereby subjecting the coloring matter contained in said fluffy mass to greater contact with the liquid and to the leaching action of carbonic acid increasing the color intensity of said liquid; said agitation preventing said fluffy solid mass from forming a packed cap and insuring free passage of gases and heat through said fluffy mass whereby gases of fermentation escape from the fermenting mixture, heat is dissipated more freely, thereby reducing the danger of lactic fermentation as well as reducing the amount of heat to be abstracted from said fermenting mixture; withdrawing the fermented liquid from said fluffy solid mass; adding water to said fluffy mass forming an aqueous suspension

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of said solids and dissolving substantially all sugars and alcohol contained in said fluffy solid mass; transferring the aqueous suspension and dissolved sugars and alcohol to a second receiver; fermenting the sugar contained in the aqueous suspension until conversion of sugars into alcohol is substantially complete and distilling the alcohol from said solid suspension.

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