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Final Report

Under UNIDO contract # 16001140

for Project XP/URT/06/002

Supply, installation and commissioning of a multi-function food processor at the Tanga Pilot Center, Muwamu Women Group, in the Muheza District, Tanga Region of Tanzania

Submitted by : Malnutrition Matters.
Date: May 9, 2007

NB: Summary / edits from first progress report follow to be included as part of final report.

The objectives of the first stage of the project were to order and ship the VitaGoat food processing system to UNDP/UNIDO in Dar es Salaam, notify UNIDO of the shipment, and to specify requirements for site preparation.

1) The VitaGoat equipment was originally ordered from the manufacturer on June 17, 2006. A revised Purchase Order for the equipment was sent on August 21, and was included as Annex 1 of the first progress report.

2) The equipment left the manufacturer in Faridabad India on August 25, 2006. The shipment consisted of two crates packed, and with markings, according to instructions in Annex D of the contract. The estimated arrival of the equipment in Dar es Salaam is October 7, 2006. The shipping company issued the Bill of Lading on Sept 5. The Bill of Lading, Invoice and Parts list (the shipping documents) are appended as Annex 2. Please note: the shipments for both Muheza and Kigoma (being the subject of a separate UNIDO contract # 16001166 for Project FB/URT/05/A06) are on the same Bill of Lading since they were consolidated as one shipment. The boxes were marked appropriately (2 boxes for each project), but they are on the one shipment.

3) Copies of the shipping documents were sent to M. Latrech and Gillian Ocampo-Goetzlinger of the Procurement Services Unit at UNIDO headquarters in Vienna as well as to Juliet Kabege of UNIDO in Dar Es Salaam immediately upon shipment of the equipment.

4) Site preparation requirements, instructions and list of materials were sent to K. Bucyana and G. Ocampo-Goetzlinger of UNIDO in Vienna, and to J. Kabege of UNIDO in Dar es Salaam in June and again to both locations on August 15 2006. Confirmation of receipt of these documents was received by Malnutrition Matters. Preparation of the site, and procurement of required materials and utensils according to these instructions, were the responsibility of UNIDO and/or its partners for this project. A copy of the Site Preparation Guide and the Preparation and Materials Guide were attached in Annex 3 of the first progress report.

Next phase – following first progress report:

1. The shipment of the VitaGoat arrived in port of Dar es Salaam in late September. Customs clearance took longer than expected, however this was not due to documentation challenges or other responsibilities of the shipper. Confirmation of exit from customs and port was received by Malnutrition Matters in late October or early November.

2. The next stage of the project assumed confirmation that the VitaGoat food processing system has reached the work site in Muheza, but due to transfer

problems in Dar es Salaam, the equipment was not delivered to the Muheza site when F. Daller and C. Lauzon scheduled for the December 06, installation and training visit.

3. With some exceptions, confirmation was received that most site preparations at Muheza were complete and confirmation was being awaited that all required materials and personnel (equipment operators / food personnel) will be available for the training visit by Malnutrition Matters personnel. Given that site preparation was to completed on time by UNIDO and its local NGO partners / personnel, a training visit was planned for December 10-14, 2006. This included Frank Daller and Charles Lauzon.

4. Daller & Lauzon arrived in Dar es Salaam on Dec 10th . Meeting was held with Juliet Kabege and arrangements were made to proceed to Muheza on Dec 11 morning.

5. Upon arrival in Muheza it was learned that the equipment was still being transferred from Dar es Salaam. Meanwhile some final preparations of the site were discussed with the local Muheza group and UNIDO reps. This included installation of a simple floor drain opening at an exterior wall, details of chimney installation, ventilation, water supply etc. Review of all materials needed was covered again, as this was supposed to come from Dar es Salaam with the shipment of the VitaGoat.

6. Difficulties continued with attempts at receiving the shipment from Dar es Salaam, and after the third day waiting, the two Malnutrition Matters specialists had to depart Tanzania due to the expiry of the minimum time that is required for set-up and training that was remaining in that week.

7. It was later decided that Muheza personnel would attend the Kigoma VitaGoat training sessions for UNIDO in March/April on the next scheduled visit by Charles Lauzon, MM tech specialist. The contract for completion of Muheza project was extended accordingly to April 2007

8. Prior to returning to Tanzania, MM liaised with UNIDO on final site preparations and materials for Kigoma project to allow for final training in April 2007.

9. Charles Lauzon returned to Dar es Salaam for April 21 and flew to Kigoma on April 22. Installation and training at Kigoma started April 23 and completed April 26. Local UNIDO and partner staff were trained on the installation to be able to help Muheza group install their own. Muheza staff attended for training on April 26. They were unable to attend earlier due to a missed flight from Dar es Salaam.

10. Charles Lauzon reviewed all aspects of the installation with the Muheza group and proceeded to produce several batches of soymilk with the participation of the Kigoma trainees. Question and answer session followed.

11. Final set-up in Muheza was understood to be scheduled soon thereafter and Malnutrition Matters undertook to provide any supplementary remote tech support info. Extra spare parts were also supplied to Muheza group both at first visit in December 06, and again in April 07.

Appendix:

1. Certificate
2. VitaGoat Technical Guide (Separate Doc)
3. Canning Food Preservation Guide (Separate Doc)

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Muheza Food Processing Project.

P. O Box 20,

Muheza,

Tanga-Tanzania.

2nd May 2007

To: **Frank Daller**

Malnutrition Matters

Food Technology Solutions

498 Rivershoer, Cres, Otawa, ON

Canada, K1J7Y7

E-mail: matters@malnutrition.org

CERTICATE OF DELIVERY, INSTALLATION AND COMMISSIONING OF VITAGOAT PROCESSING-MUHEZA FOOD PROCESSING CENTER

We acknowledge receiving two wooden boxes containing Vitagoat Machine which was installed on 30th May 2007 by ***Mr. M Ndonde*** (local technician) who attended training in Kigoma conducted by ***Mr Charles Lauzon*** (Expert). The machine was tested on 2nd May 2007 by processing of soy milk. The performance of the machine was good as it was noted in Kigoma.

Juma Makweba

UNIDO-National Food Consultant

Muheza Food Processing Center

CC: **Kawira Anne Bucyana**

United Nations Industrial Organization,

Vienna International Center,

P.o Box 300, A-1400, Vienna Austria

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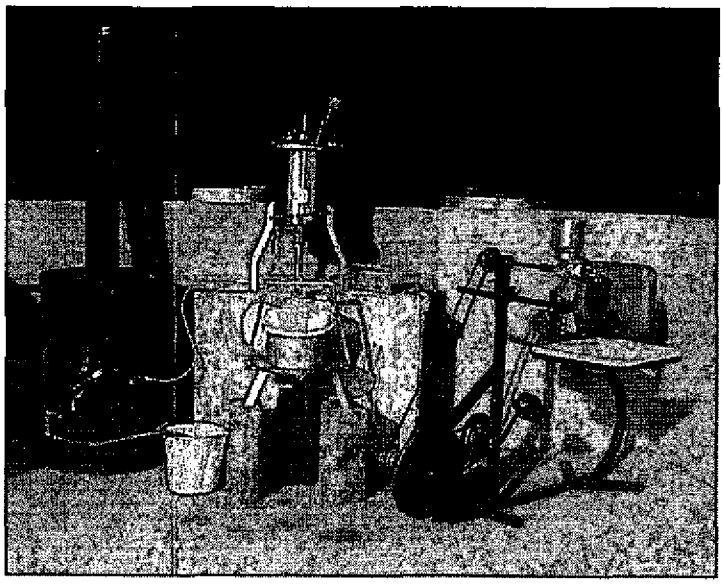
VitaGoat Technical and Operation Guide

September, 2005



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VitaGoat Technical and Operation Guide

Contents

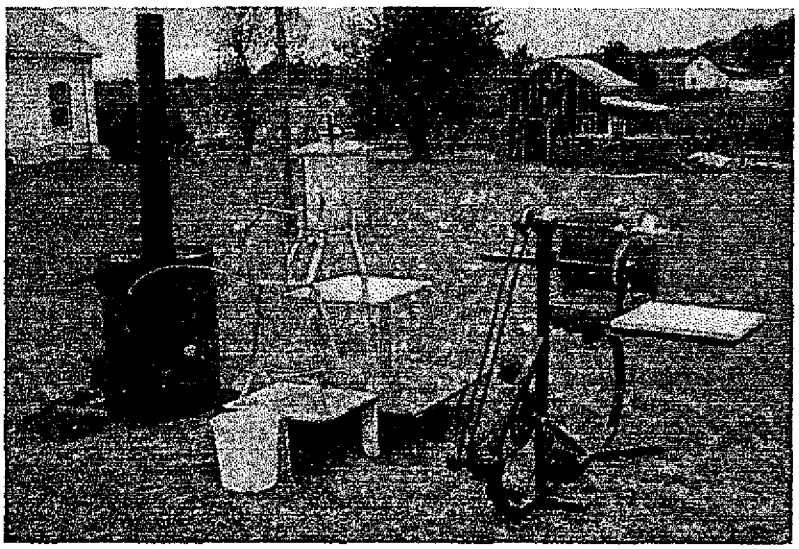
Introduction

A Non-Electric Food Processing System
For Nutrition and Micro-Enterprise Development

The VitaGoat is a food processing system for developing countries. It serves as a principal vehicle for micro-enterprises, while providing the local community or social institution with high-quality nutrition. Operating without the need for any electricity supply or generator, it uses locally-available fuels, including wood or other biomass, or bottled gas, for the cooking section of the operation. This is a critical feature, due to the unavailable or unreliable supply, and/or high cost of electricity in most developing countries.

The full system includes four components: A pedal-operated grinding / blending system, a steam boiler, a pressure-cooking vessel and a filter press. The use of steam-injected pressure-cooking is up to 10 times more energy-efficient than traditional open stove cooking. Some foods can also be prepared without the cooking section.

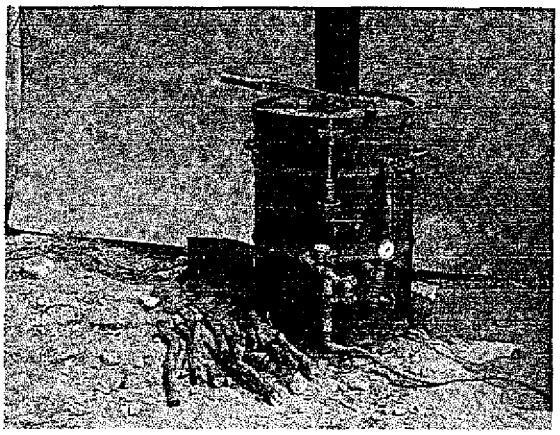
The VitaGoat's processing capability features economical, high-protein and healthy **soya foods**, in the form of soymilk and its derivatives such as tofu and yogurt. Other cooked and processed foods such as soups, sauces and purees, can be made from **various fruits and vegetables.** An extra food-preserving vessel is in development to allow for long shelf-life. The cycle-grinder alone can process **peanut butter, soy and other nut butters,** and grind **cereals and grains** into meals and some flours.



The VitaGoat System

The VitaGoat has four main components although one of these, the cycle grinder, can be used on its own in situations where only dry foods are processed without cooking.

1) Steam boiler: Operates on wood or other solid fuels or liquid gas. Steam-injected pressure -cooking can be 10 times more fuel efficient than traditional open fire cooking and more efficient than improved stove-design cooking. Water is heated in an inner chamber and the resulting steam is re-heated in a tube, creating a "superheated steam" that is much hotter than regular steam. The steam is then fed into the cooker. The boiler is inexpensive to build, safe, and can be taken apart for cleaning, which is critical since most boilers accumulate scale on their inner shells and eventually fail.



2) Cycle grinder: Based on a design originally created in the mid-70's in the US, energy is produced through a pedal-powered system that uses adjustable-speed pulleys, permitting fast and easy grinding of a variety of foods. An inexpensive modified hand mill using metal to metal plates grinds foods at least ten times faster than with traditional methods.

Seating is adjustable depending on the operator's height and the adjustable speeds can be matched to the individual's strength and the type of food.

Soymilk Production

3) Cooker: Made from stainless steel, this vessel can pressure-cook up to 15 liters of food per batch, in thirty minutes or less. This greatly reduces cooking time and saves fuel. It is equipped with temperature and pressure gauges and a safety pressure relief valve. Product is fed through a top opening and steam enters the vessel through an opening on the bottom. Cooked product exits the cooker at the bottom, through a valve-controlled outlet.

4) Press: Also made of stainless steel, pressing occurs by turning a screwed rod that pushes onto a sanitary plastic disc, in turn squeezing out liquid from product held within a filter bag. The press is very simple to operate and clean.

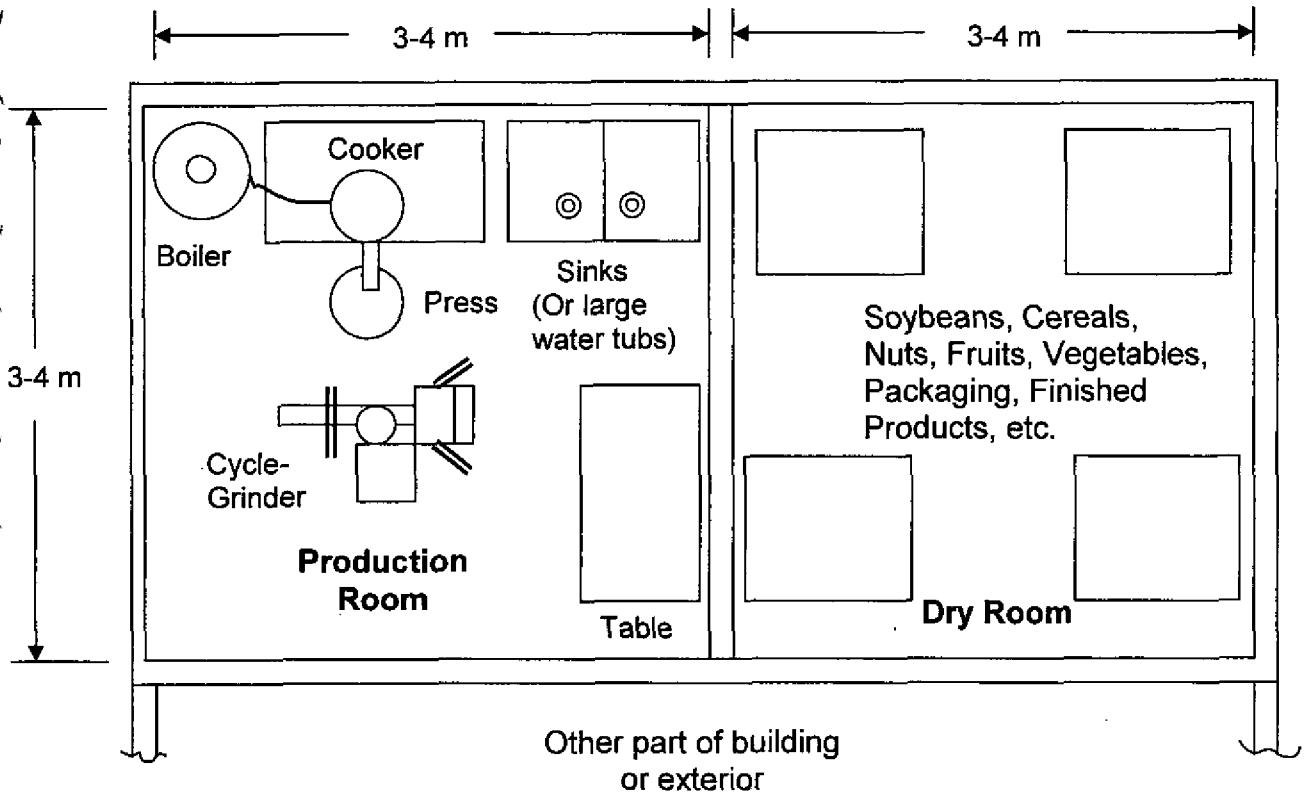
VitaGoat Food Production

Foods	Production capacity	Full System	Cycle grinder only
Soymilk from whole soybeans and soymilk-derived foods such as tofu, soy yogurt and sour soymilk. The fibrous by-product "**okara**" also has many food applications.	30 liters/hour (8 USG/hr)	√	
Fruit or **vegetable** sauces, purees and juices	30 liters/hour (8 USG/hr)	√	
Flour or meal from corn, sorghum, wheat, soya, rice, millet, etc	8 – 12 kg/hour (20-30 lbs/hr)		√
Peanut or other nut butter or paste	8 – 12 kg/hour (20-30 lbs/hr)		√
Ground roasted **coffee**	6 – 8 kg/hour (12-20 lbs/hr)		√

VitaGoat Site Preparation Guide

Requirements	Done
1. Production Room 'Wet Area' (see schematic on following page) **a)** Approx. 10-12 square meters minimum with a high ceiling (3 M or more)	
b) Large sink(s) or tubs for cleaning.	
c) Floor of cement or tile, preferably with floor drain or at least a place to wash spills out. Walls should also resist water and humidity.	
d) Good ventilation, with screened windows, fan or vents for air circulation.	
e) The boiler is to be located either in the corner of the room or directly outside the exterior wall from the other equipment. If it is to be located outside, it must be under a roof, and not more than 1.5 meters from the inside equipment (a steam hose connects the boiler to the cooker.) **Chimney pipes of 2 meters are included with the boiler, but they must be connected to local pipe to exit the room at the wall or directly exit the roof over the boiler. This must be done at the time of installation, so materials must be available.**	
2. Dry Room for the storage of food supplies, etc. **a)** Not in the same room as the production area, to avoid splashing with water. Heat and humidity greatly speed the deterioration of the dry food.	
b) Dry room to have ventilation and protection from insects and rodents.	
c) Approx. 10 - 12 square meters of space.	
3. Utensils, and other furnishings required. **a) 2 medium size tables or work surfaces (about 1 M x 1.5 M) One must be not more than 75 cm high (relatively low). Tops should be washable.**	
b) Vessels for the soaking of soya beans : Minimum of 5 plastic pails – approximately 15 liters.	
c) A large quantity (5-10 sq. m.) of cheese cloth, gauze or muslin cloth for use in soymilk or other filtration and tofu production.	
d) 2 large cooking / mixing spoons	
e) 2 large colanders or sieves (1 for the production of tofu and 1 for draining and rinsing soaked soybeans.)	
f) Vessels to contain and produce soymilk and other liquid products : Minimum of 5 pails – 15 - 20 liters each, clean and made of durable and washable plastic or steel.	
g) 1 small step or box (approx. 30 cm or so.) to stand on to put food into top of cooker. (cooker stands on table)	
h) 1 large perforated spoon.	

i) 1 large knife	
j) 1 large ladle	
k) A dowel or wood bar approximately 40 cm long and 4 cm diameter.	
l) Rubber or plastic gloves and work boots. (Long - for protection of worker against hot splashes and for sanitary work.)	
m) Work clothes or covers for all workers.	
n) A scale which weighs up to 5 kg.	
4. Water **a)** A source of drinking water, either from a well or roof tank, etc. Water does not need to be purified.	
b) A hose for water, to clamp to a 2.5 cm diameter fitting on the boiler, with a length enough to reach from a water vessel or tank to the boiler.	
c) A water filter if the water is cloudy or with sedimentation.	



Preparation, Materials, Equipment and Food Supplies, Required for the Installation and Production of the VitaGoat

A) Preparation

a) Transport the two VitaGoat boxes to the site before the arrival of specialist – trainer. (leave unopened) ☐

b) Verify and accomplish all the points listed on the document **'VitaGoat Site Preparation Guide'** including procurement of all the indicated utensils and furnishings. ☐

B) Material and Equipment

a) Combustible material, such as dry wood (minimum 25 kg) Wood should be small to medium size firewood. Otherwise charcoal or bottled gas is an option. Fire starting material is also required. ☐

b) A tablet or chalkboard with chalk for instruction / training. ☐

c) **Optional:** Glass jars with lids for food preservation demo (like canning). 500 ml or 1 L jars, whatever is locally available. X 10 units. ☐

d) A 'handyman' or carpenter / mechanic / plumber with tools, to assist in the installation.. ☐

C) Food Supplies

a) Soya Beans -20 kg ('Food Grade' is best, others will also work) ☐

b) Common cereals or grains to produce a flour or meal (corn, sorghum, etc.) - 20 kg ☐

c) Peanuts - 10 kg – Should be shelled, preferably lightly roasted. ☐

d) Other local nuts if available and inexpensive ☐

e) Local tropical fruits if inexpensive – 5 -10 kg each ☐

f) Mangoes – 5 kg or more if not expensive and in season ☐

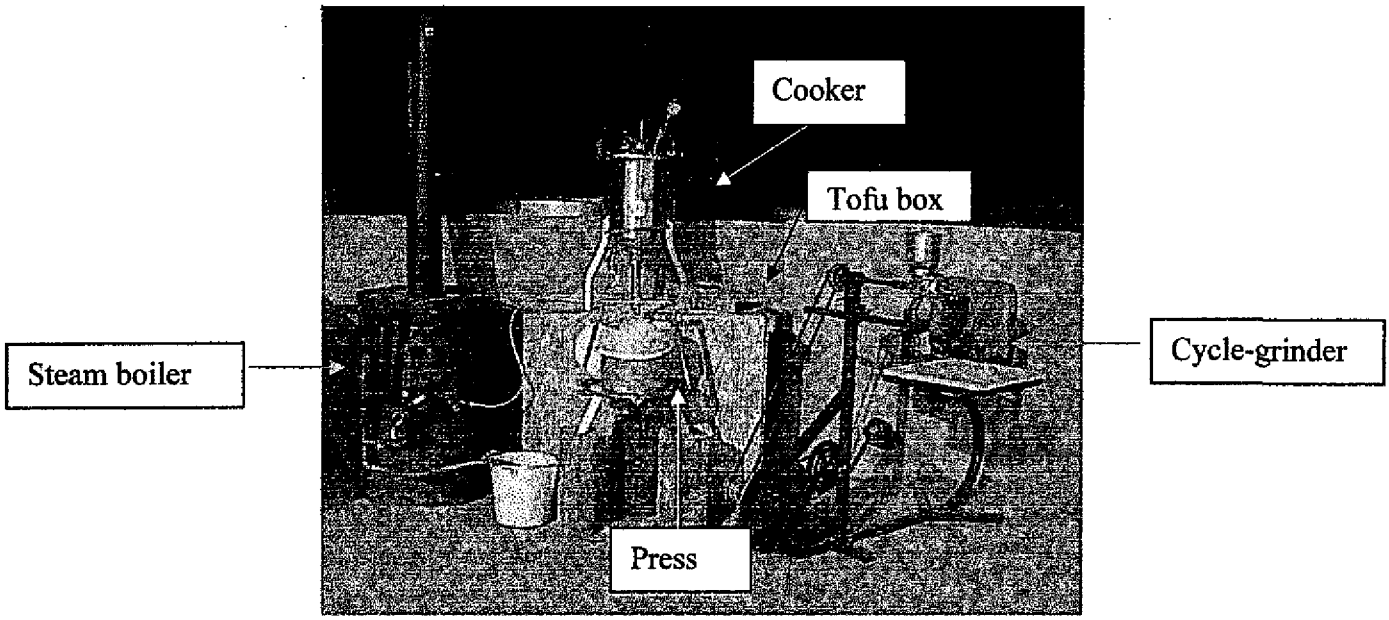
g) Tomatoes – 10 kg ☐

h) Salt - 1 kg ☐

i) Sugar - 5 kg ☐

j) Food grade coagulant for making tofu. Any one of : Magnesium Chloride, Calcium Chloride, Magnesium Sulfate (Epsom Salts), Citric Acid, etc. **Common vinegar will substitute if any of the above are not available.**

2. VitaGoat General Components



VitaGoat System

The complete VitaGoat system should be set up as shown in the photo. The Cycle-grinder does not need to be close beside the rest, however, the rest of the system must be set up as shown.

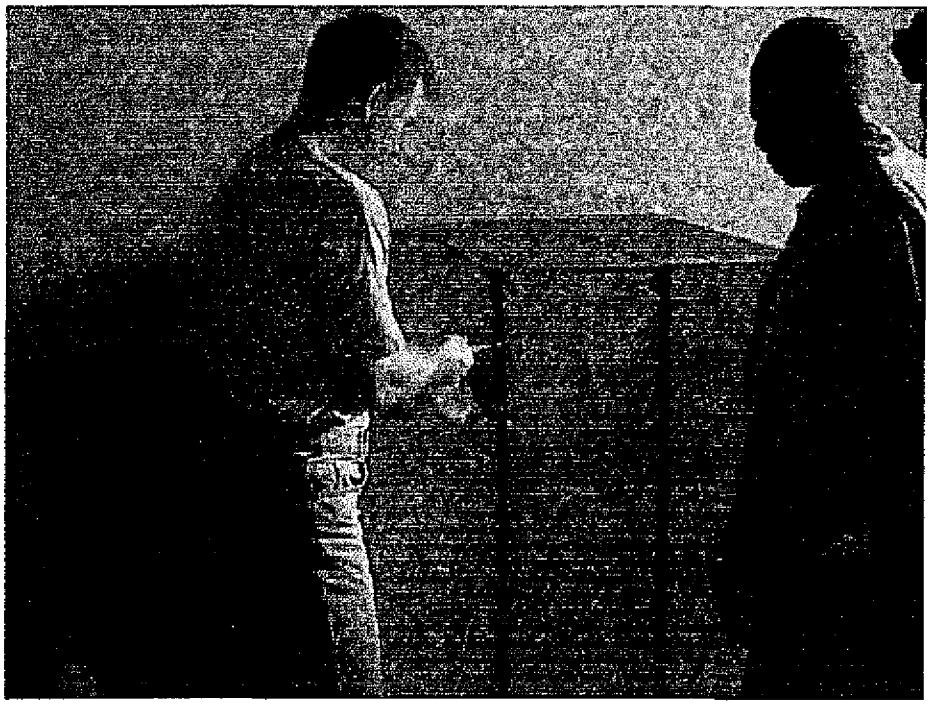
Note that the cooker should be placed on a table which is not higher than the boiler. The cooker can then be emptied into the press. The press must be on a low stand, high enough to place a pail or other vessel below to receive the *finished product*.

The Steam boiler must be placed so that there is room on the left side to insert wood or other fuel into the firebox.

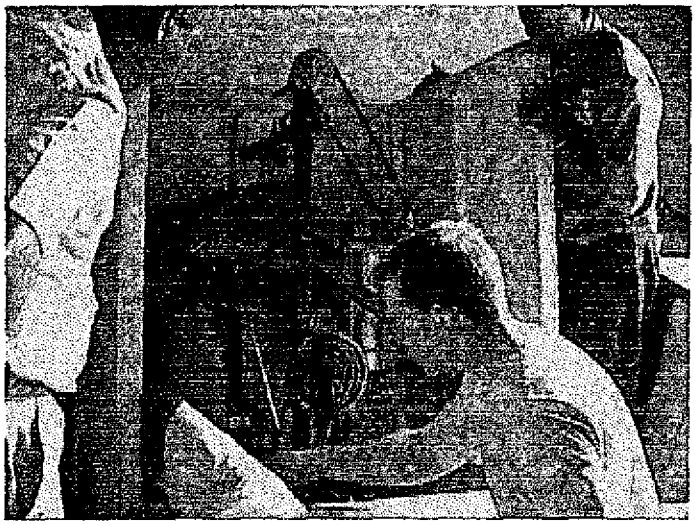
See other set-up details in the Site Preparation Guide and section 3, Set-up guidlelines.

3. Set-up Guidelines

The VitaGoat equipment is normally shipped in two wooden shipping crates. The smaller one contains the steam boiler and its spare parts, while the larger one contains the other three main components. The larger one has all the major pieces bolted to the inside of the shipping crate. For both it is best to open the top and one side of the crate for removal of the equipment. It is recommended that three people handle each crate, because of the weight and to protect the contents.



Opening the larger shipping crate.

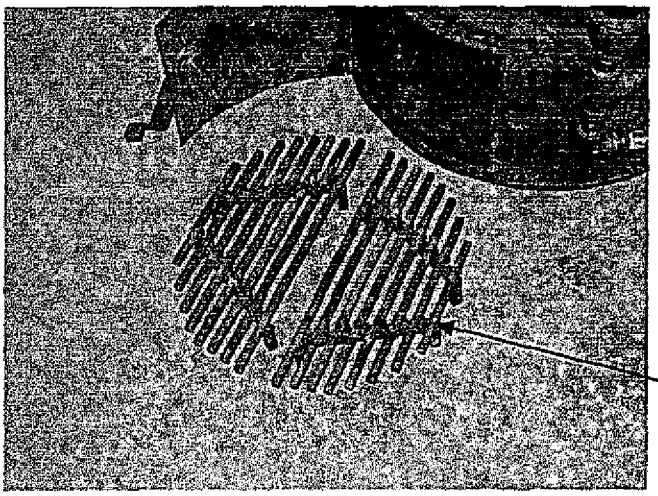


Removing sections from the larger crate.

3. 1 Setting up the Steam Boiler

Open the smaller boiler crate directly beside the site of the installation. After opening the top and one side of the boiler crate, carefully remove the boiler from the crate and move it to the area where it will operate. This should be on the left side of the table area where the cooker will be situated.

The simple chimney outlet (through the roof or wall) should be directly above the boiler location and there should be enough room on the right side of the boiler to allow for fuel to be put into the door at the bottom of the boiler shown below.



Open the firebox door and inspect the Boiler Grates, then place them side by side as shown into the center of the boiler fire box.

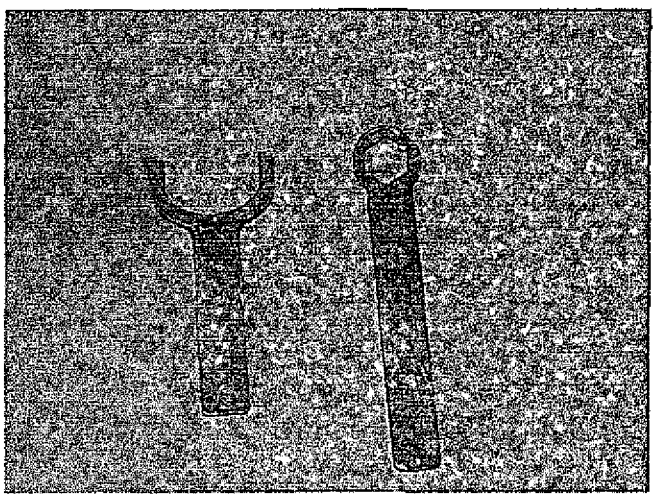
Boiler Grates

Reassemble the water pump handle.

The two bolts at the top of the assembly must be removed and then the pump handle assembly can be reconnected in the usual pump formation.

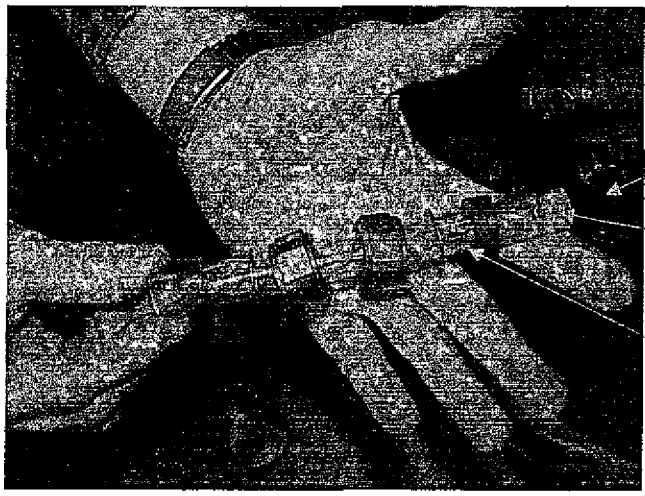
The boiler's hand pump handle in the unassembled position

Locate the two special wrenches attached to the boiler, and put them aside in a safe place. They are critical for later maintenance of the boiler.



On left: Water pump wrench
On right: Cleanout nut wrench

Assemble the water level "sight glass".



Sight glass assembly

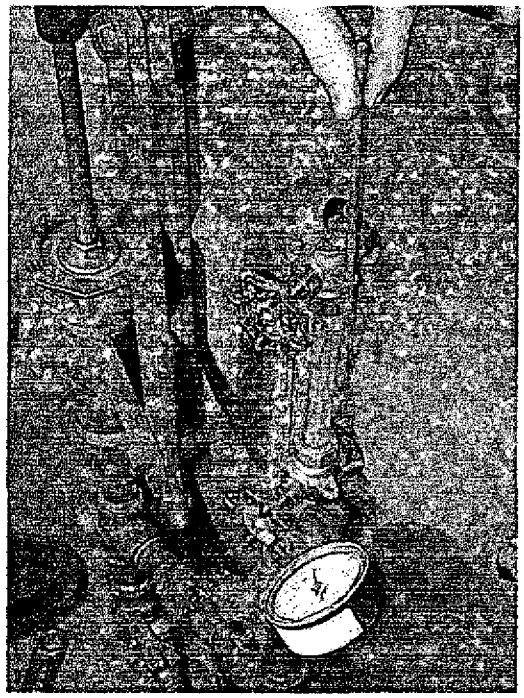
The rubber and metal parts are found connected to the sight glass position on the right side of the boiler. Remove the securing nuts and washers and the rubber grommets. Take the glass tube from the parts kit in the top of the boiler, and place the nuts, washers and grommets (two each) on the top and bottom half of the sight glass tube.

Inserting sight glass into valve assemblies

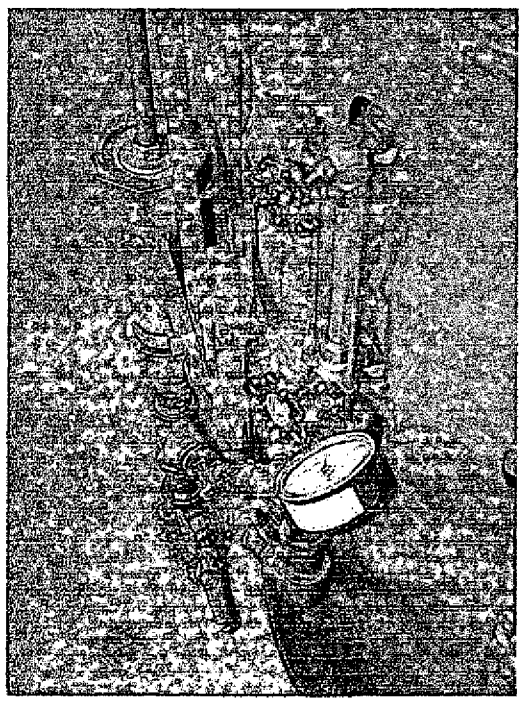
Make sure that the rubber grommets are at the ends of the tube, and that the washers are between the rubber grommets and the nuts. Place the tube into the top and bottom fitting. **Gently tighten the top and bottom nut just enough to ensure there will be no water leak, but not enough to break the glass insert the sight glass protection rods.**

Install the sight glass protection rods.

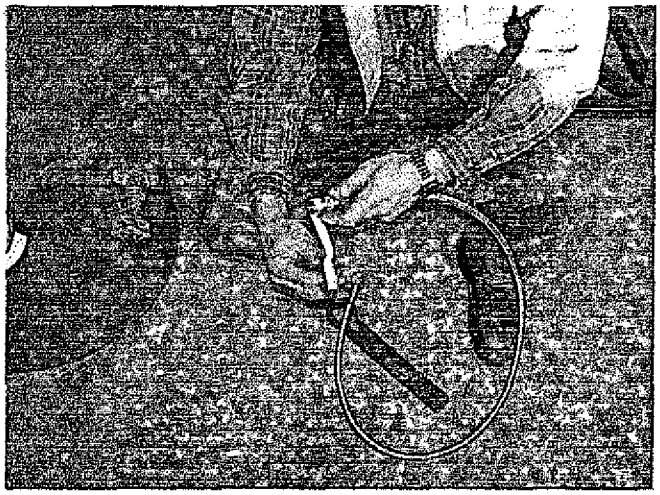
Inserting sight glass protection rods



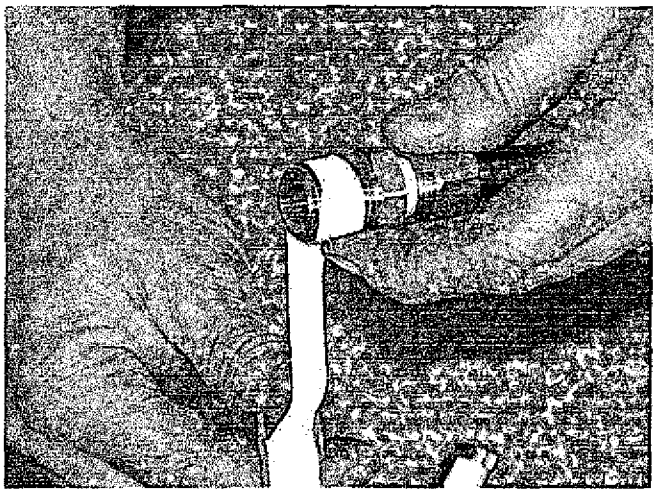
Finished sight glass assembly



Install the steam hose.



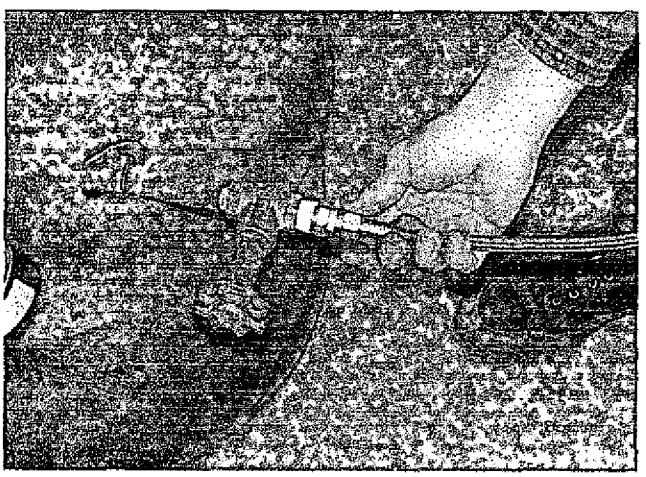
Preparing steam hose



Applying Teflon tape to threaded fittings

Use approximately two layers of Teflon tape wrapped around the steam connections. **This process is done at all steam pressure points including all connections inside and outside the boiler assembly and the inlet and outlet of the cooker.**

Connect the steam hose with tape on to the steam outlet on the boiler.



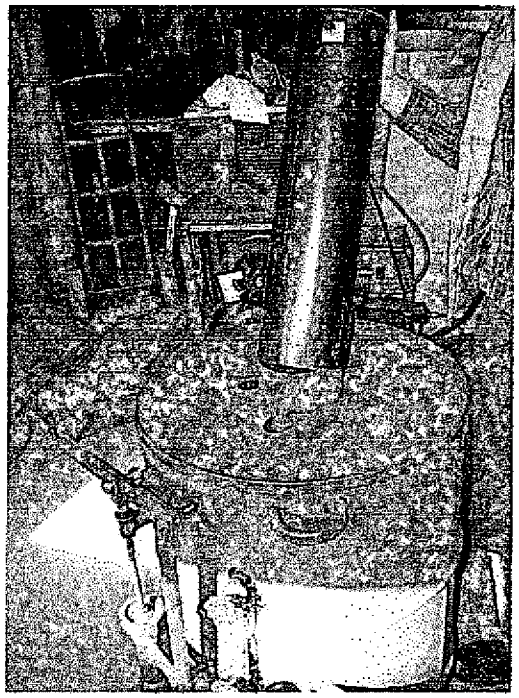
Connecting steam hose to boiler

Installing the chimney.

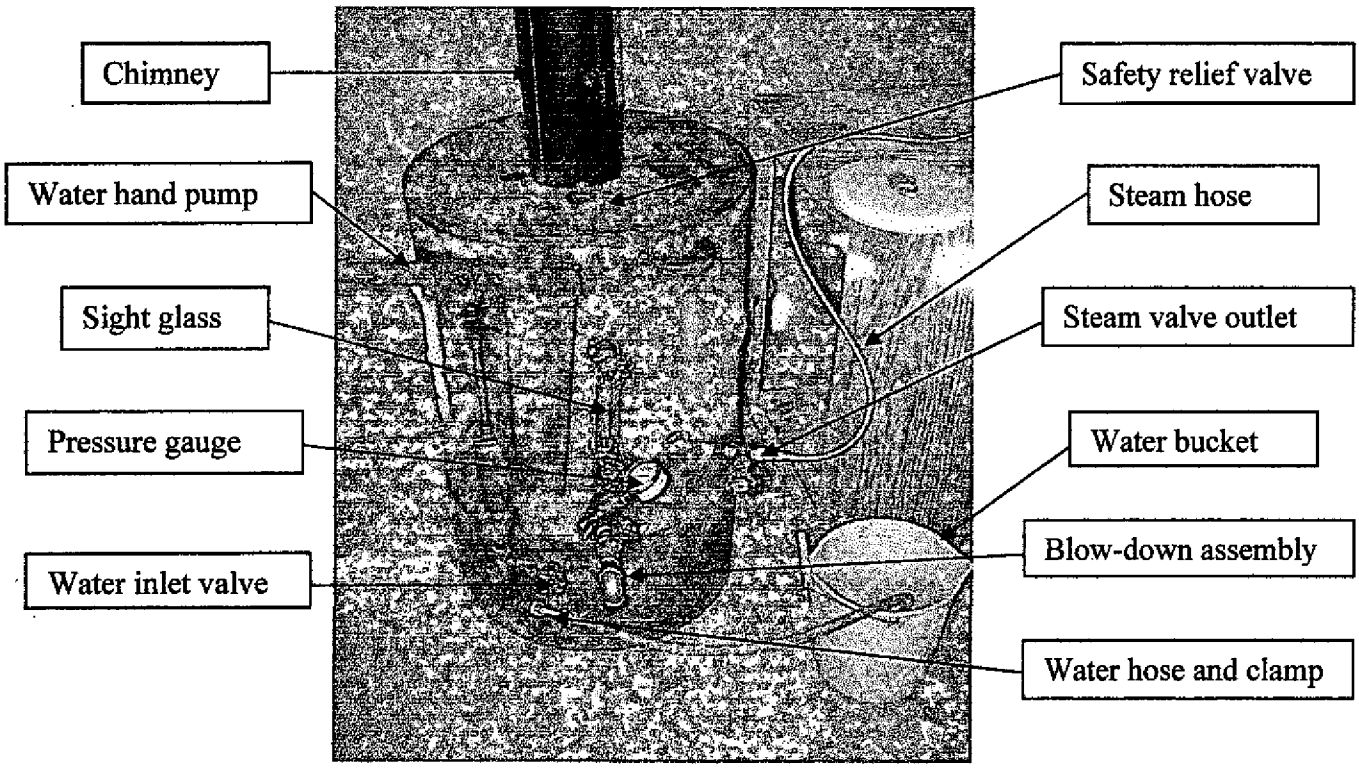
The boiler is shipped with two lengths of chimney pipe which will reach approximately 1.5 meters. **It is critical that the location of the installation is prepared with additional chimney pipe and an outlet through the wall or roof immediately above the boiler installation.**

The chimney outlet and pipe is 6 inches or 15.25 CM in diameter.

The only remaining connection is a simple hose to be attached to the water inlet.



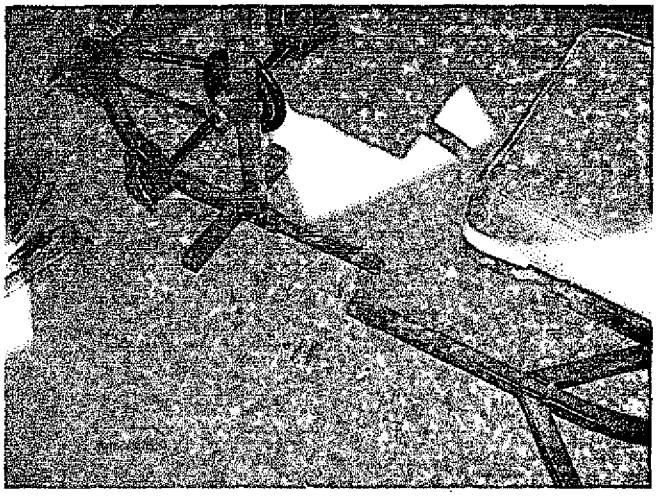
Inserting chimney pipe into boiler top



Steam boiler components

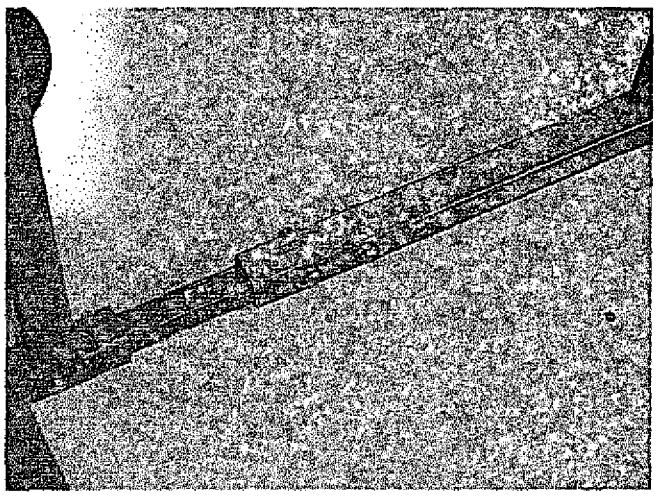
3.2 Assembling the Cycle Grinder

The Cycle Grinder parts should all be removed from the shipping crate and laid out for easy identification and assembly.

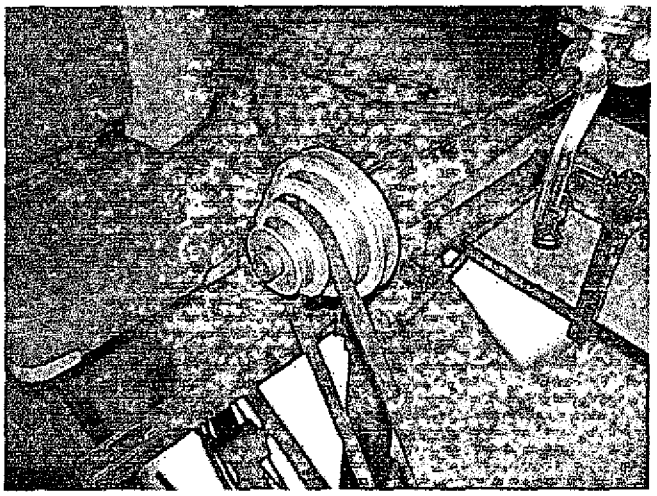


The first step is to connect the two major sections with the two bolts provided. This can be adjusted to two or three positions but should be firmly connected. The seat assembly also can be moved back and forth for operator comfort.

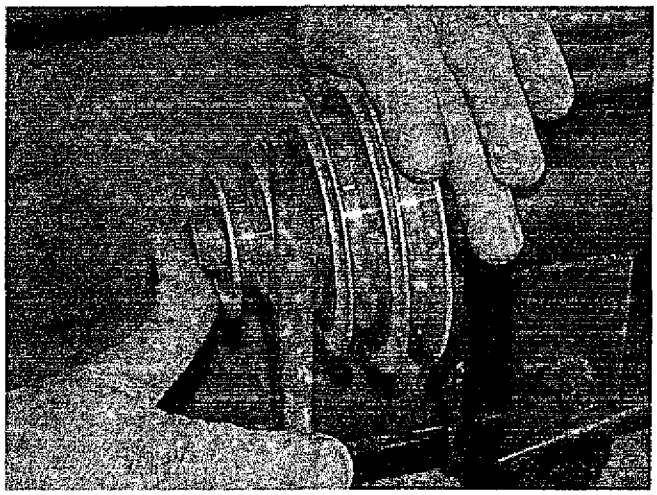
Connecting cycle-grinder frame sections



Bolted frame connection. Note adjustable position.



Top adjustable pulley

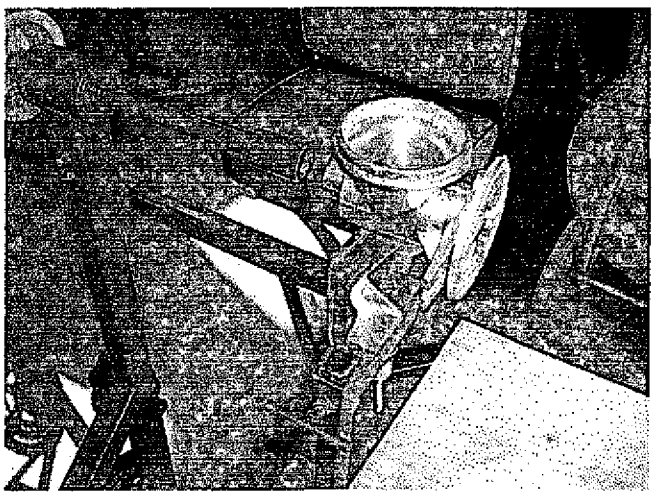


Changing pulley-belt speeds

Adjusting the pulley-belt and speed of action.

Depending on the operator's strength and the type of product being ground or blended, the position of the pulley-belt can be changed at the top and bottom pulley. This is done by hand without any tools. Simply grip the belt and force it to the new position while turning the pulley. Repeat this step for the second pulley.

Installing the grain mill.



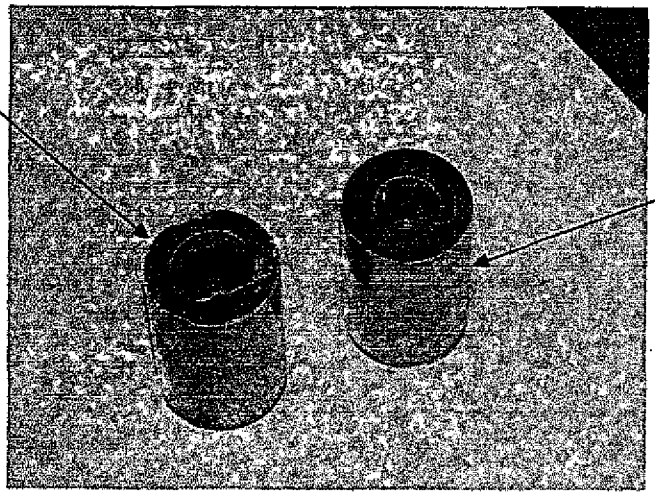
Clamp grain mill to support arm (note lower position)

The VitaGoat system comes with two processing attachments, a grain mill and a fruit mill. Each has a different position when being installed.

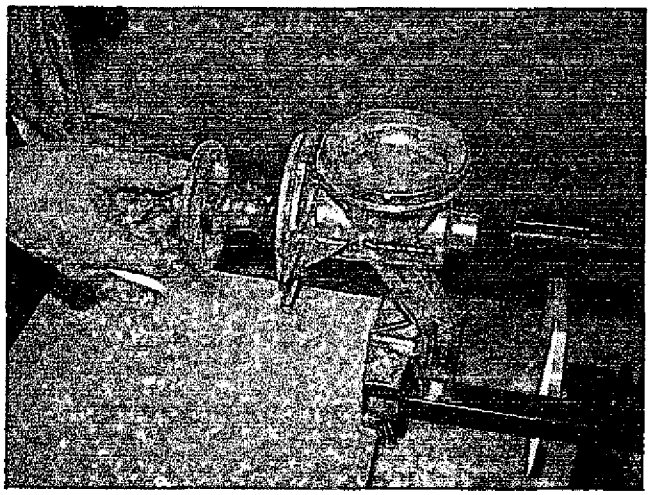
When tightening the clamp on installation or later re-tightening during production, use only a strong hand tightening, and not a tool. Over tightening can cause breakage.

Upper and lower mill mounts. Top is for grain mill, lower is for juice mill

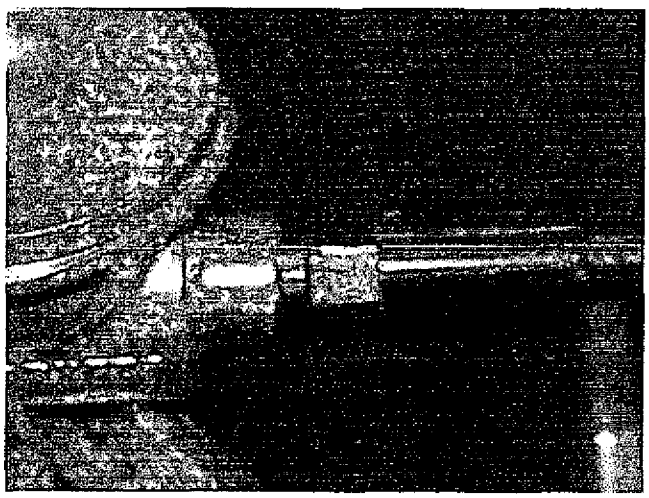
Note the two different couplings. Select the larger hole size for the grain mill, when connecting it to the cycle grinder assembly.



Mill couplings – note smaller hole size for juice mill coupling

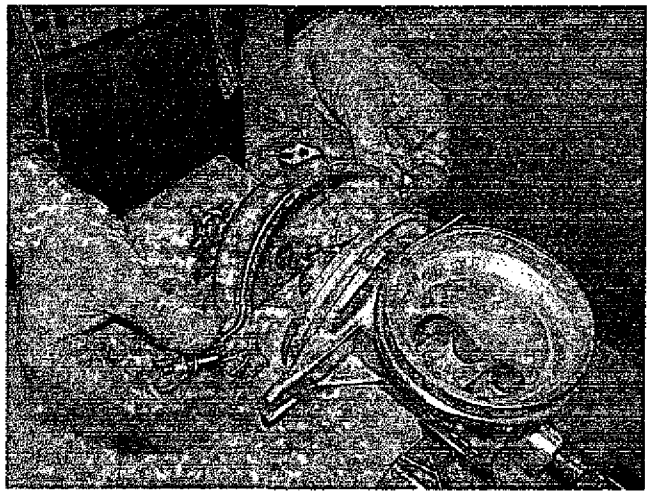


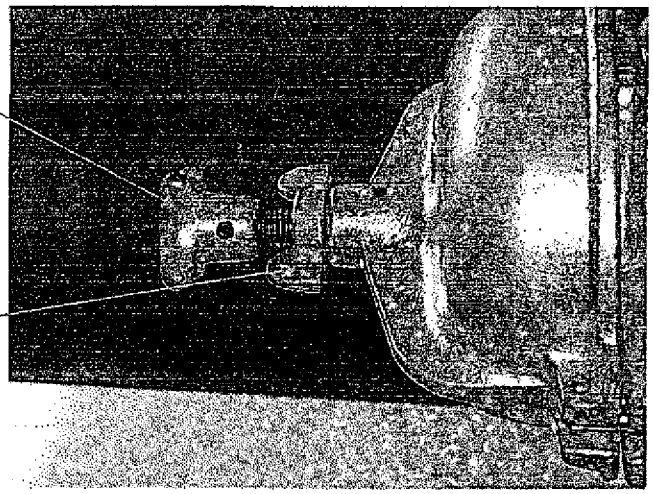
Insert auger into mill



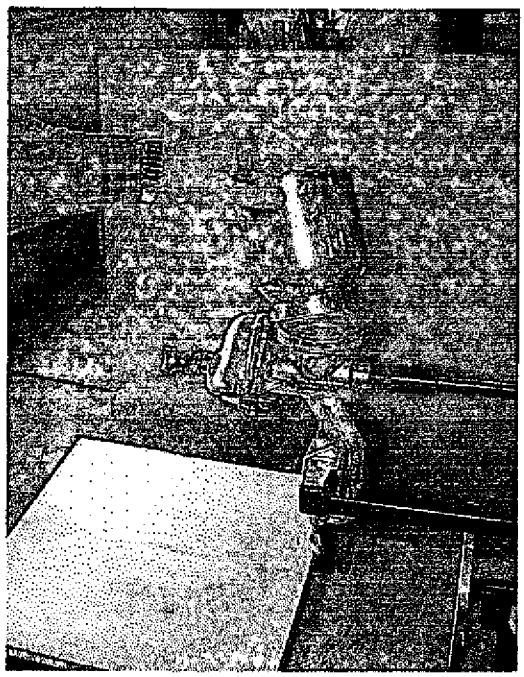
Position auger shaft into coupling

Attach mill hood. Position by centering with hole



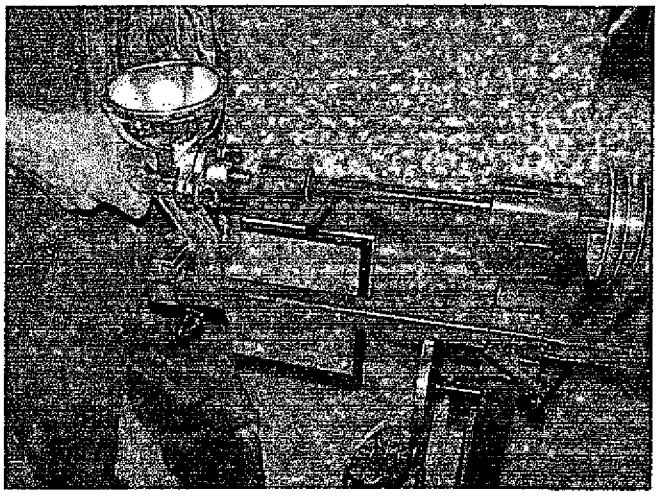


Adjust milling size by screwing knob and locking in place with clamp

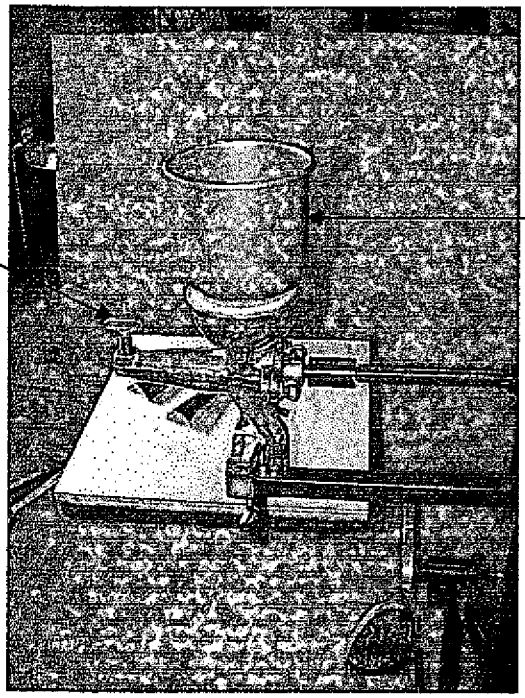


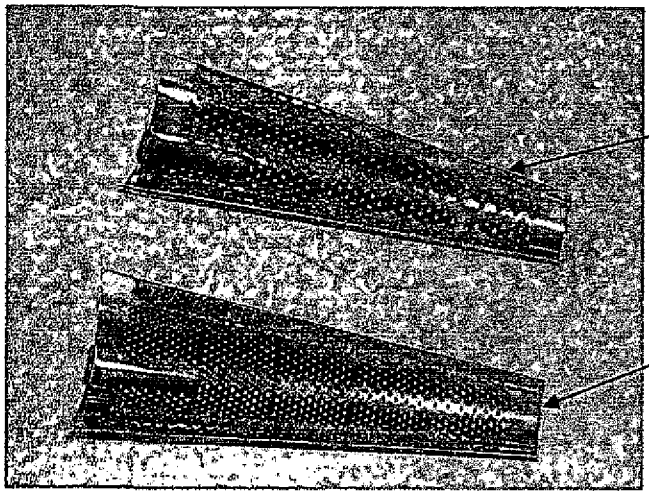
Attach funnel. Note locking pins on side

Installing the juice mill



Juice mill installation. Note upper mount position for mounting arm



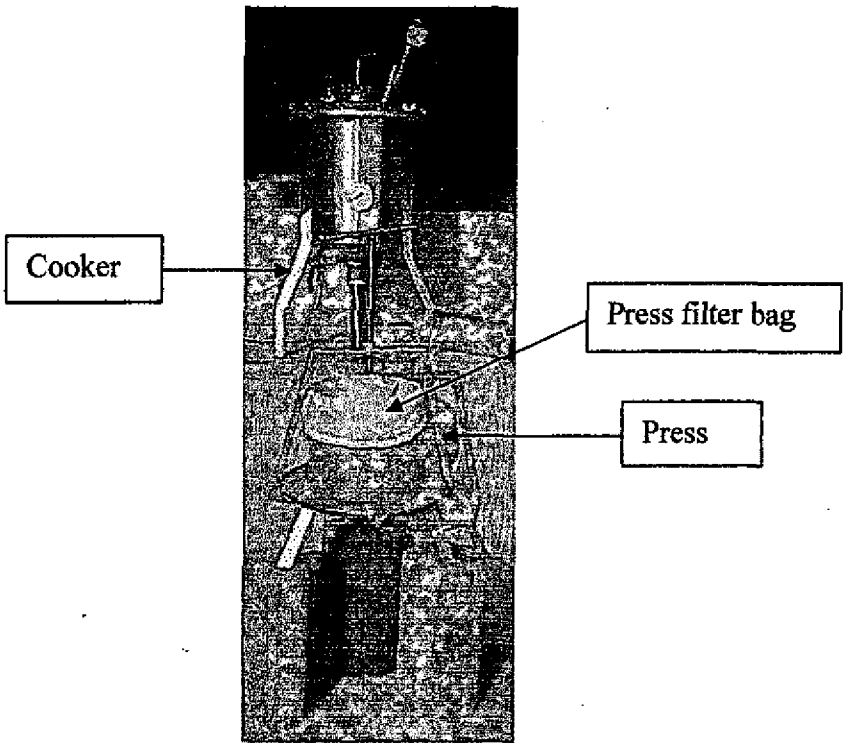


Fruit mill screens. Use coarse screen for sauces and purees and fine screen for juices or nectars

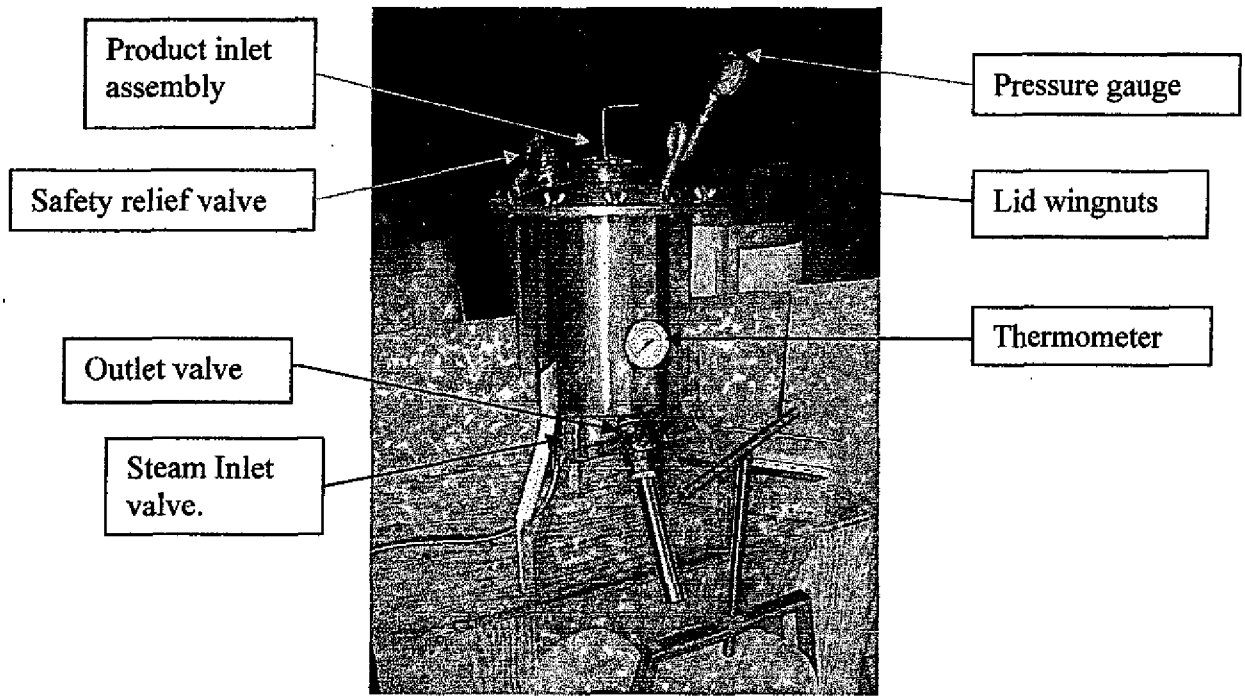
Adjusting the Cycle Grinder seat.

Cycle-grinder seat adjustment

3.3 Installing the VitaGoat Cooker and Press



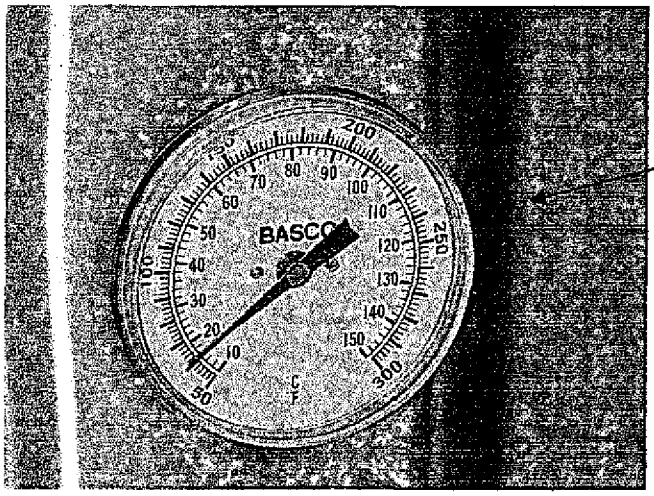
The VitaGoat Cooker and press are shipped mostly pre-assembled. They should be set up as in the photos, immediately to the right of the steam boiler. After placing the cooker on the table, it should be connected to the steam hose from the boiler. The connection to the steam inlet valve on the bottom of the cooker is done with Teflon tape.



Note the pressure relief valve assembly. This should be facing the back of the operation.

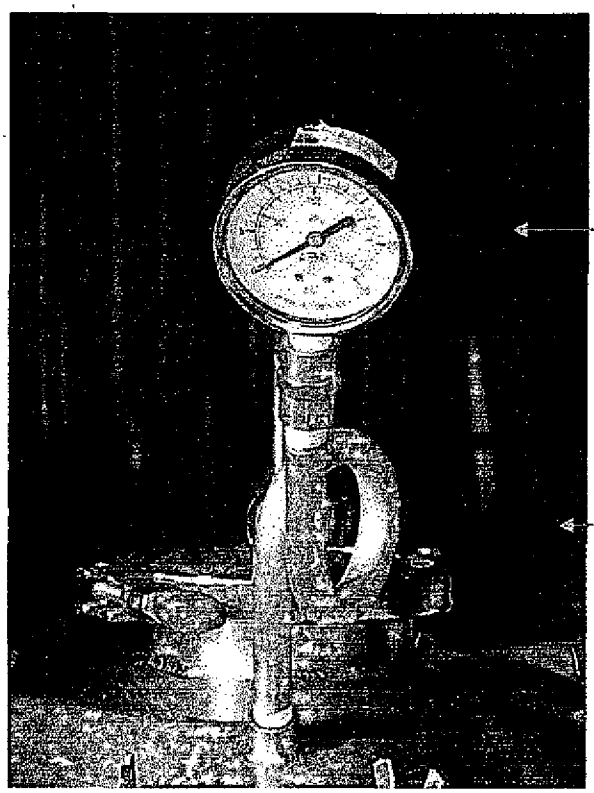
Pressure relief valve assembly

Note the thermometer and Soymilk production temperature range.



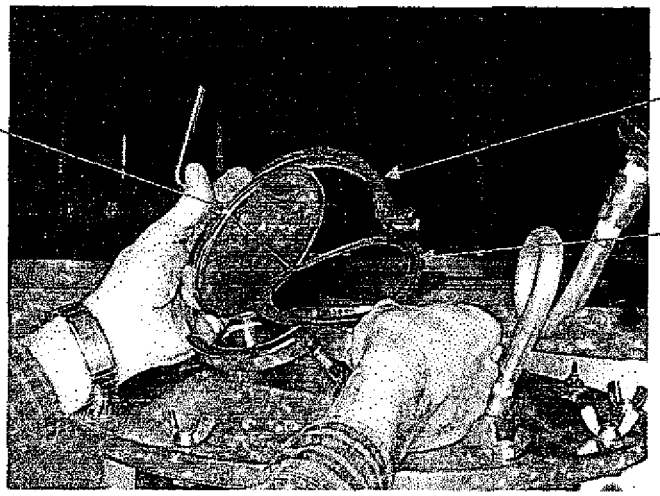
Cooker thermometer

Note the Pressure gauge assembly. The pigtail connection is to prevent fluids and cooked material from entering into the bottom of the gauge. The pressure gauge should be viewed regularly to avoid excess pressure, which can cause the pressure relief valve to open and release the contents of the cooker. This assembly must be handled with great care when the system is disassembled for cleaning.

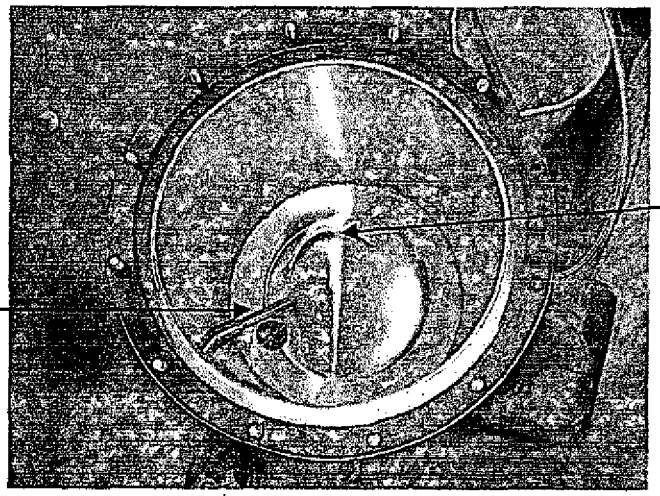


Cooker pressure gauge assembly

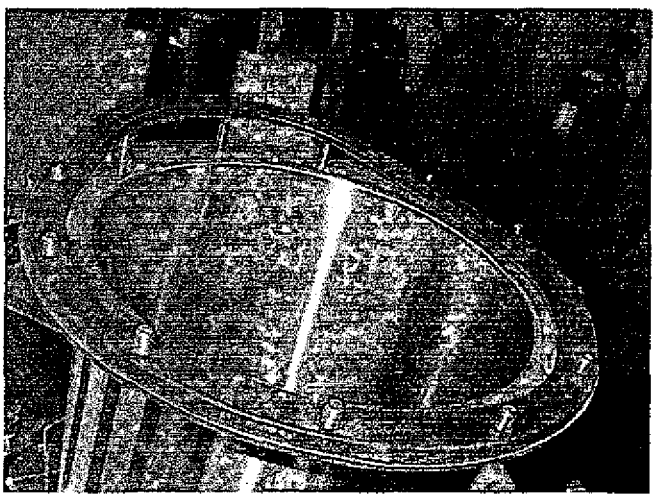
Note the cooker lid assembly. The gasket must be placed carefully into position under the cap. It should be oiled regularly to provide proper sealing and extend the life of the gasket.



Cooker product inlet assembly



Cooker inside view



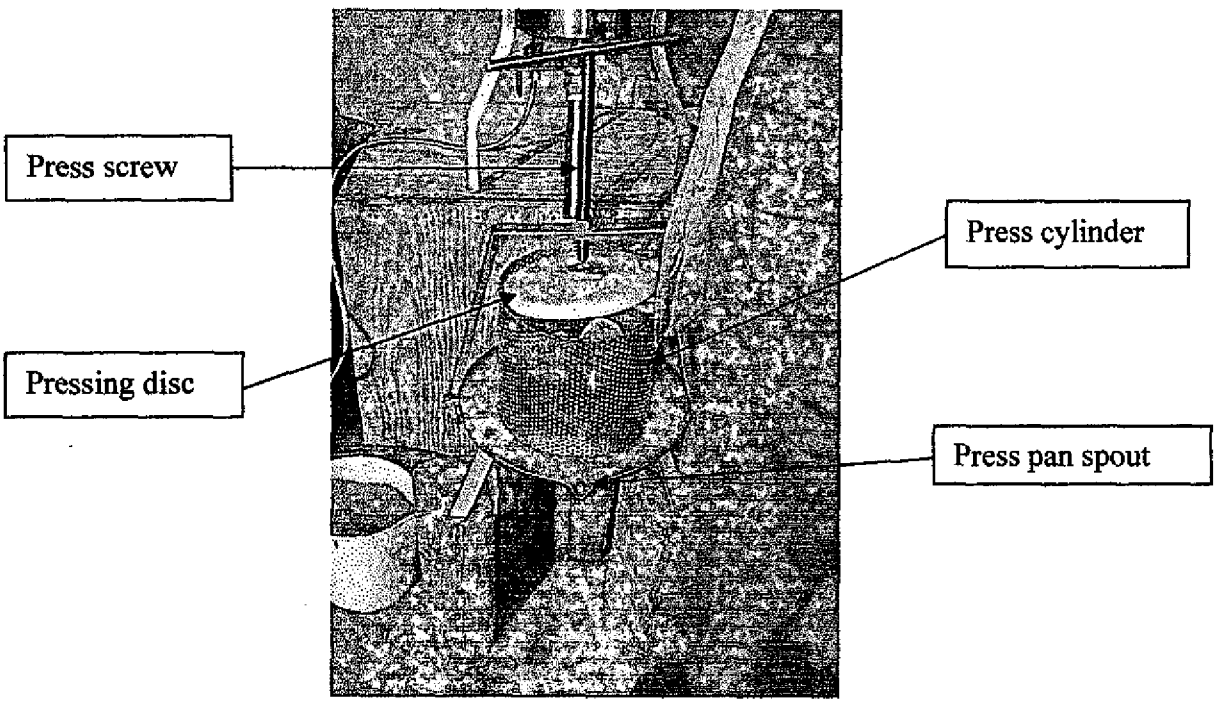
Note the main cooker gasket. It should be regularly oiled for proper operation and long life. Use any vegetable oil.

Cooker lid gasket

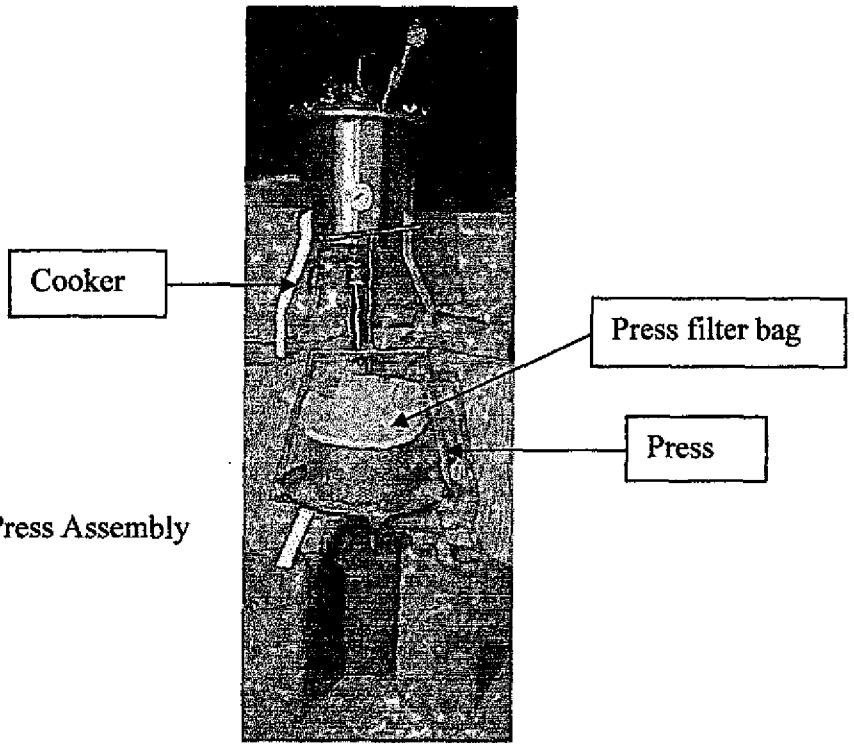
The mill hopper can be used as the cooker product inlet hopper as well

Installing the press.

The press should be placed up off the floor enough to allow for a large vessel to be placed under the spout. The cooker should be placed directly over it so that the cooker outlet pours directly into the center of the press cylinder and filter bag. This requires that the height of the table is somewhat lower than most common tables.

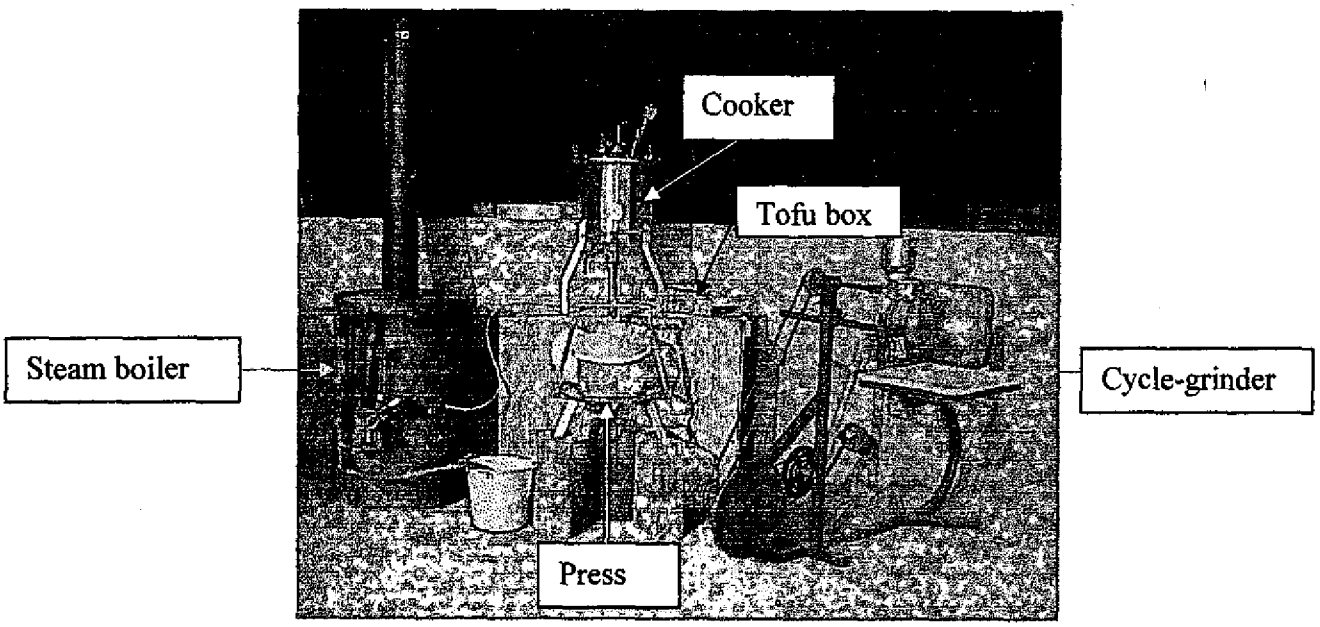


Filter press assembly



Cooker and Press Assembly

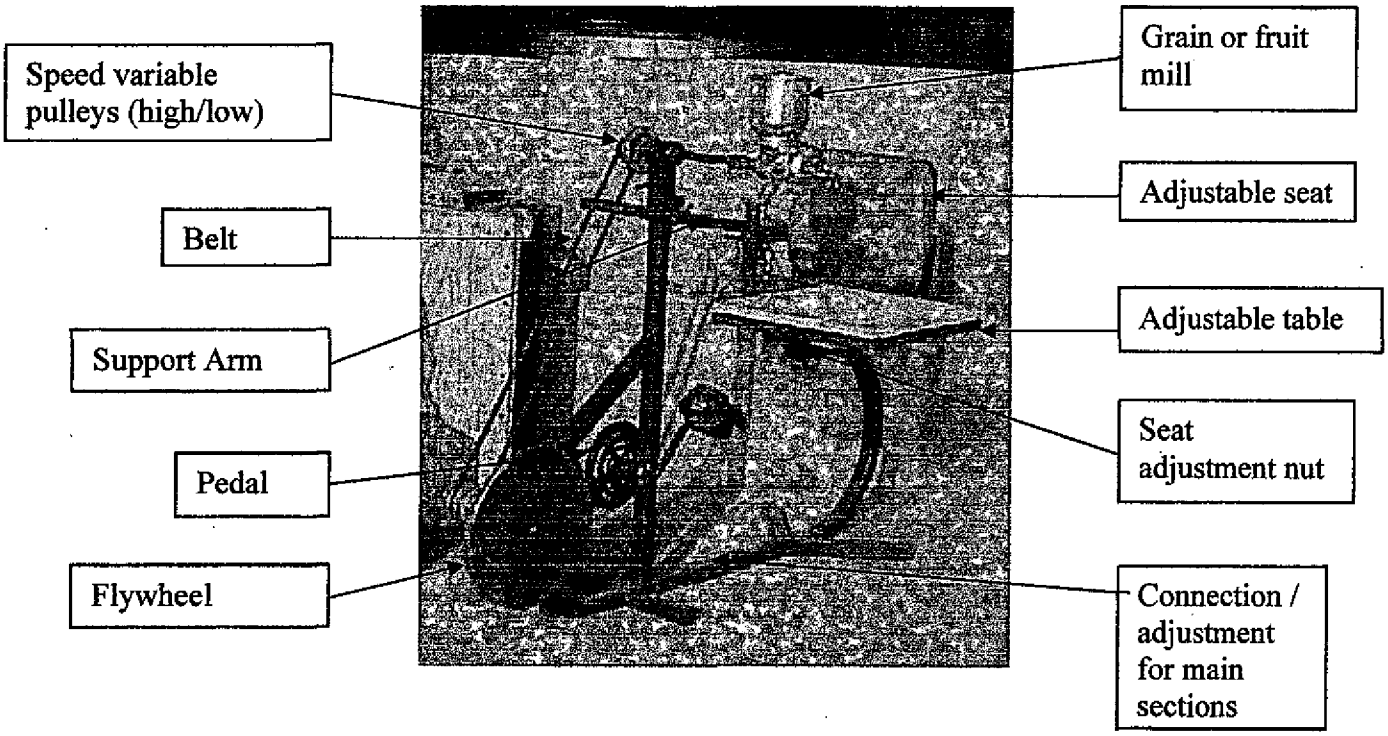
Here the complete system is shown assembled. The cycle grinder is shown beside the cooker but it does not need to be so close to the cooking and other processing area.



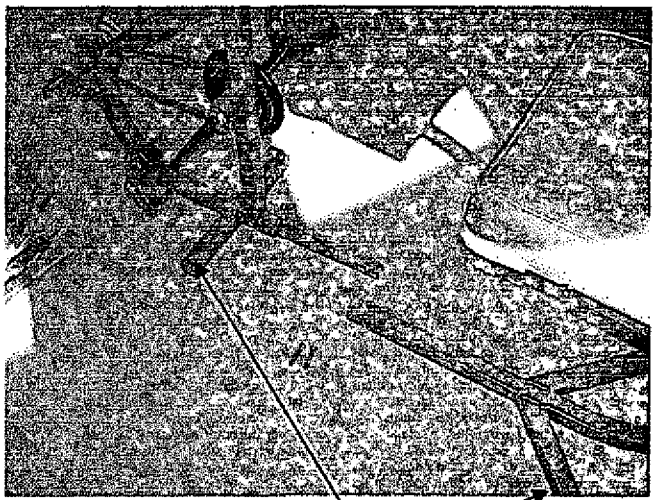
VitaGoat System

4. Cycle Grinder Operation / Maintenance

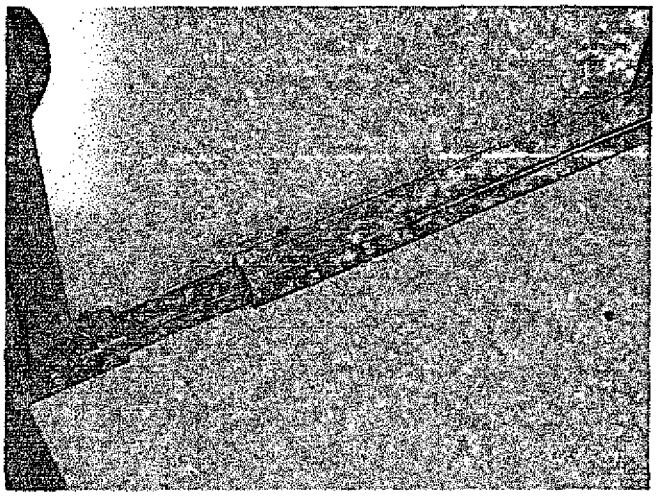
4.1 Cycle Grinder Components



4.2 Connecting and adjusting main sections.



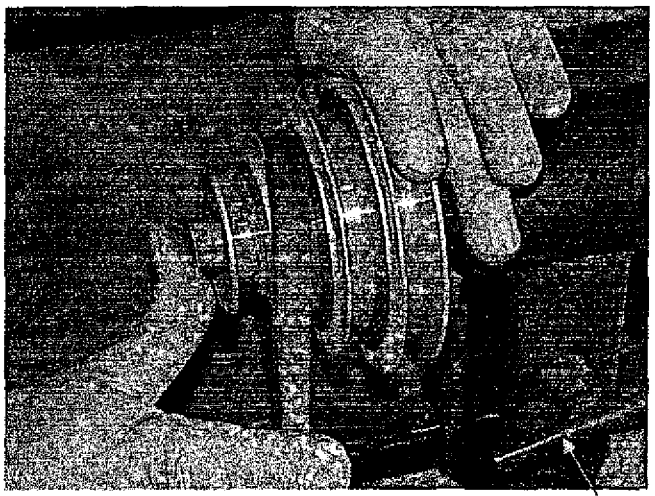
As mentioned in Section 3, "Set up Guidlelines" , you must connect the two main sections with the bolts provided. There are two main positions possible, depending on the length of the operators legs. (The seat can also be moved forward and back.) Bolt this connection tightly. After the location of the cycle grinder is determined, it is advised to bolt the main sections to the floor using the holes provided.



Connection of the bolted sections.
Note the two positions possible.

The seat position can be adjusted using the sliding connection. Adjust according to the operators' leg length to allow comfort and also power for pedaling.

4.3 Adjusting the speed of grinding

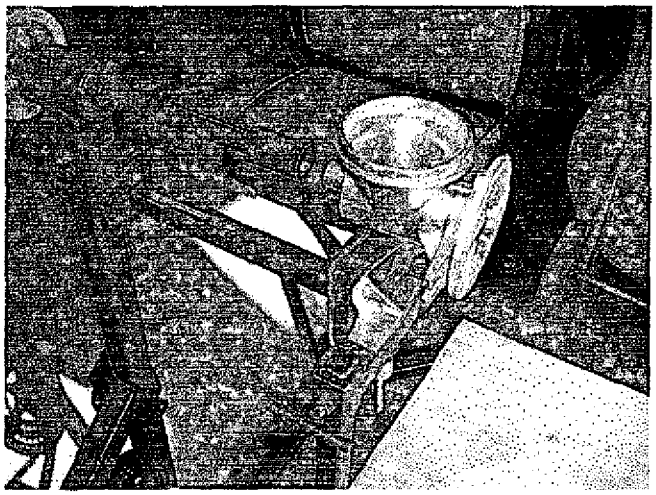


Changing the speed of grinding

Depending on the strength of the operator, and the type of food being ground, the position of the belt can be changed. This is done manually without tools. Loosen the pulley adjustment nut (if necessary) While turning the pulley, force the belt to the new position as shown. Repeat with the second pulley. The small groove in the upper pulley is for hard products (such as peanuts) and the large groove is for soft products (such as fruit and soaked soybeans). Reset the pulley assembly by forcing it upwards and locking the nut.

4.4 Installing the grain mill

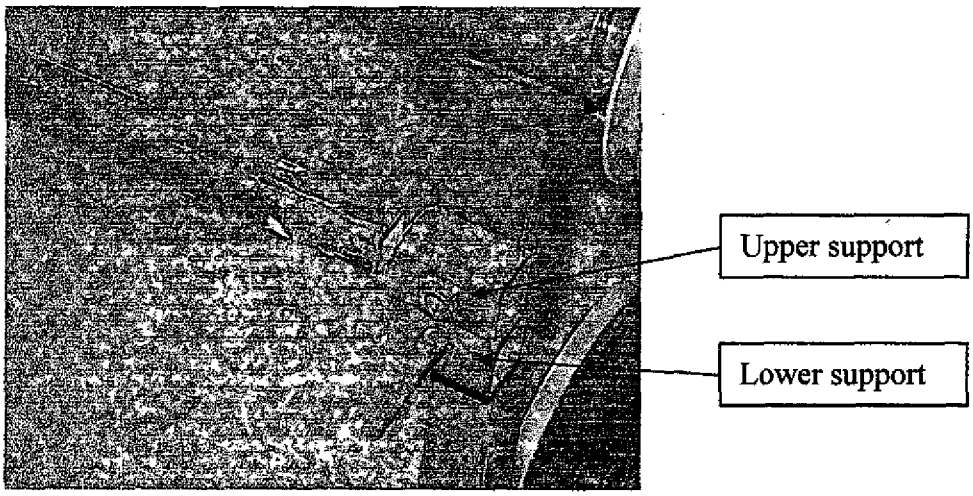
The grain mill is used for grinding dry products such as cereals, grains and nuts as well as for grinding soaked soybeans.



Attach the mill to the support arm. Note the position of the arm on the support arm.

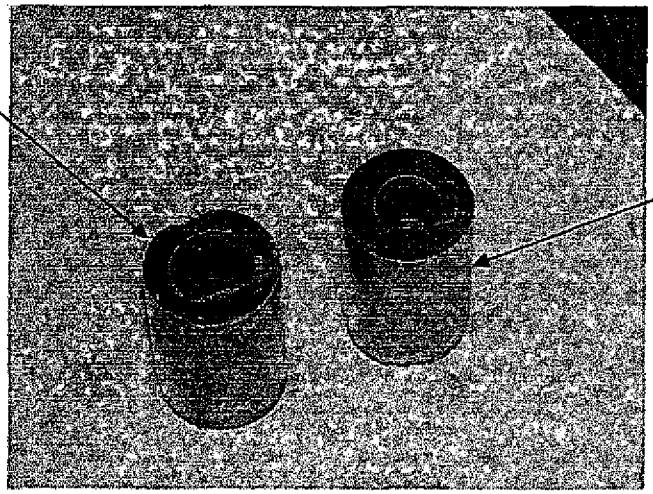
Two types of mills come with the VitaGoat: A grain mill and a fruit mill. Each has a different position when installed.

When you install the mill while locking it after installation or tightening it during production, only tighten by hand and never with a tool. Too much tightening can break the mill.

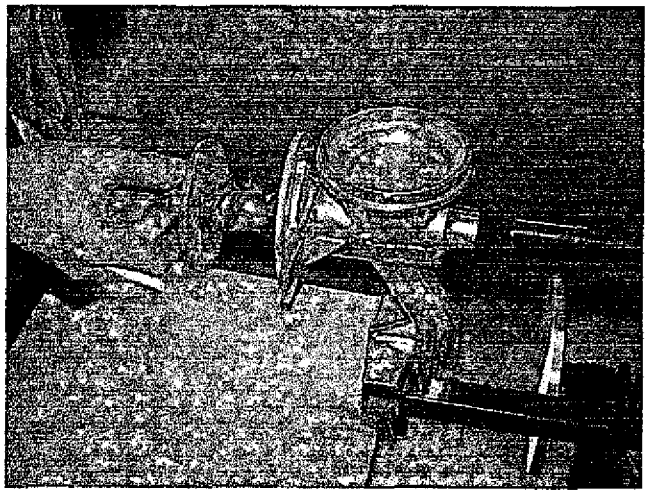


Upper and lower arm support positions.. The upper position is for the fruit mill, the lower for the grain mill.

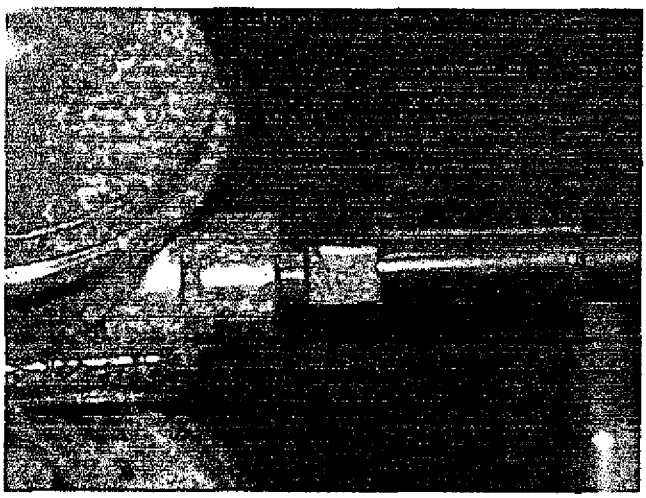
Note the two different couplings. Select the larger hole size for the grain mill. The coupling is placed on the principal shaft drive. Do not over-tighten as you may damage the threads and make it difficult to change later.



Mill couplings – note smaller hole size for juice mill coupling

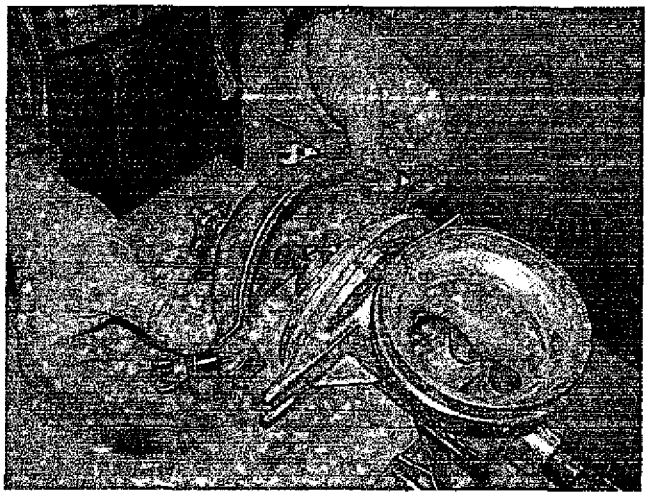


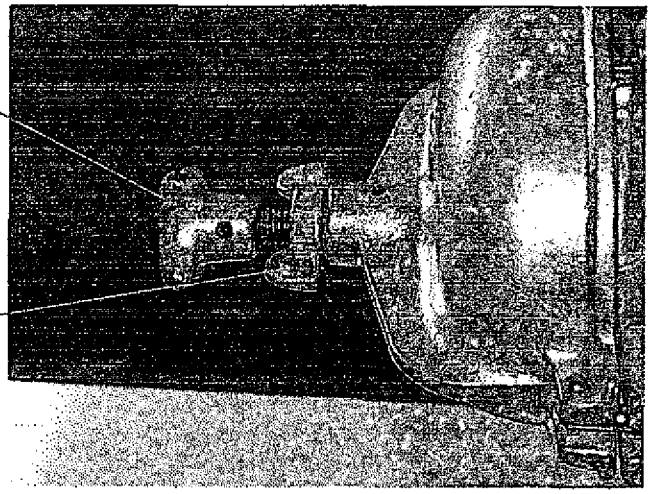
Insert auger into mill



Position auger shaft into coupling

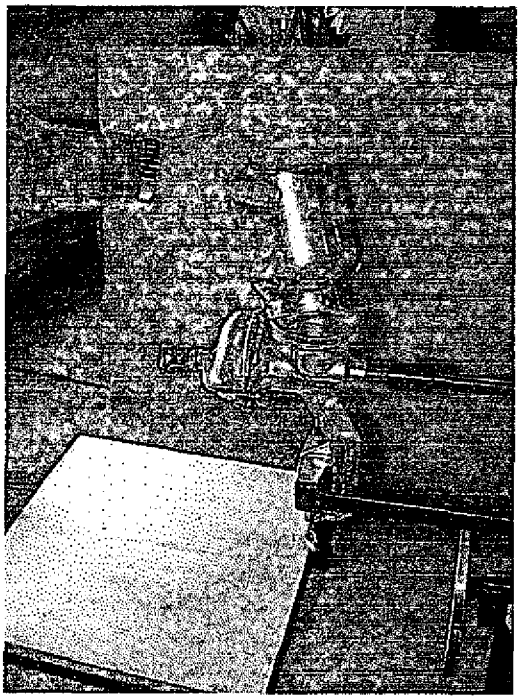
Attach mill hood. Position by centering with hole





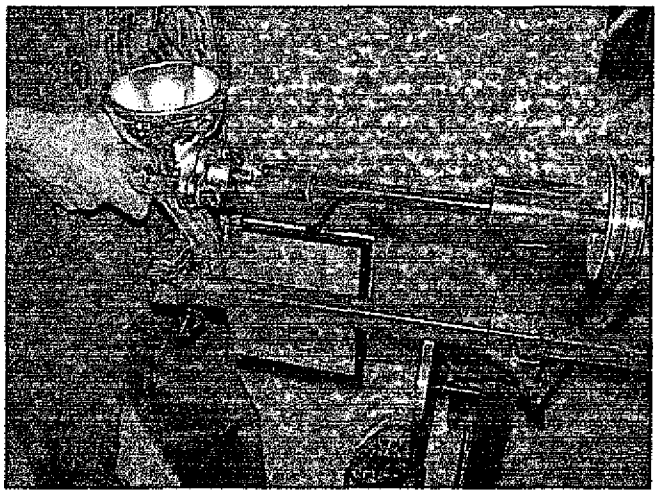
Adjust milling size by screwing knob and locking in place with clamp

Attach funnel. Note locking pins on side



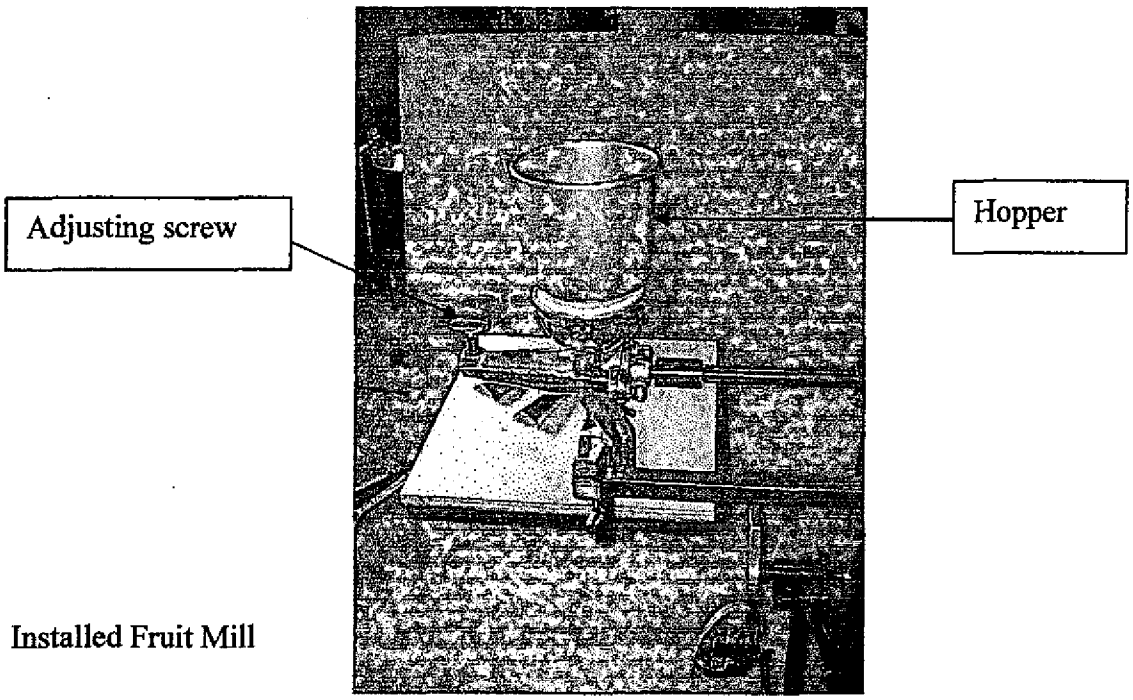
4.5 Installing the fruit mill

The fruit mill is used for processing fruits and vegetables into juice, sauce, pureees, etc.



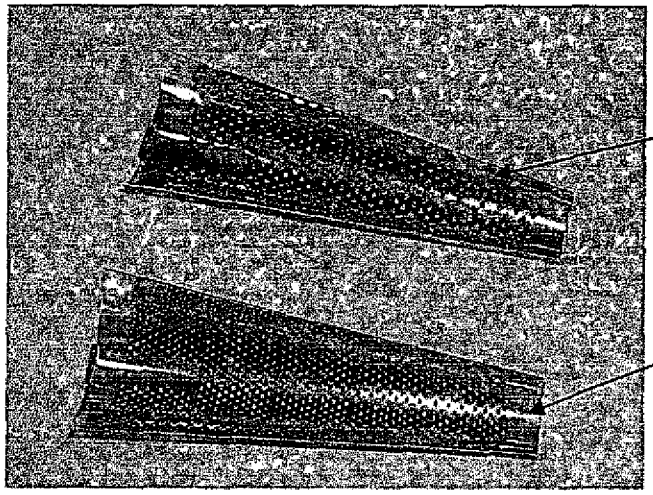
Installing the fruit mill. Note the upper position for the support arm.

Place the hopper on and lock in position and the system is ready to use.Turn the adjusting screw according to the density of the desired product. Do not tighten too much as it will result in poor product consistency.



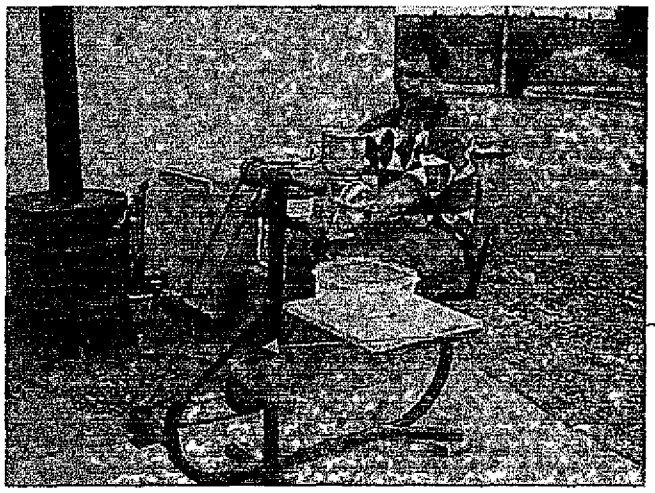
Installed Fruit Mill

Fruit mill screens. Use coarse screen for sauces and purees and fine screen for juices or nectars



4.6 Grinding and pedalling

Now one can sit on the seat and begin the operation. **Note that two persons are required to operate the grinder : One for pedalling and the other for putting food into the grinder and handling the output.**



Insert feet into the straps on the pedals. These straps increase the efficiency of the system while using the full energy of the legs.

Hold the support arm with both hands to stabilise the operator and best transmit the power of the legs.

4.7 Mainenance

1. Grain Mill

a) After each use: Clean the grinding disks with the aide of a small brush and check to be sure that no food residue is left; wash all the other components with the help of a brush and water, and **leave apart to dry**. Do not put the whole assembly in water because it may rust. When dry, periodically use a little vegetable oil on the main shaft of the mill.
b) After each three months: Check the mill carefully to see that there is no premature wear on the parts.

2. Fruit Mill

a) After each use: Clean the mill with the aide of a small brush and check to be sure that no food residue is left; wash all the components with the help of a brush and water, and **leave apart to dry**. Do not put the whole assembly in water because it may rust. When dry, periodically use a little vegetable oil on the main shaft of the mill.
b) After each three months: Check the assembly carefully to see that there is no premature wear on the parts.

3. Belt

Inspect weekly to make sure there is no premature wear. Check proper alignment and tightness to prevent unncessary wear.

4. Cycle chain and pedal assembly.

After each day of use, oil with a little vegetable or motor oil.

5. Seat

Protect with a cover cloth to extend life of the seat. If the seat assembly is adjusted regularly, oil the channel under the seat.

6. Paint

Retouch the paint if scratched or worn off. This will help prevent rust.

7. Whole system

Clean any spill or food from all components after each use. Keep a sanitary and food safe condition for the system. Oil any wearing parts, using vegetable oil where there is possible contact with food.

This page is to be copied and displayed in the area of the VitaGoat operation

BOILER OPERATION ALERT

- **Keep boiler full of water when not using. (reduces rusting)**
- **After filling a cold boiler, release unwanted air pressure by briefly opening steam valves on boiler and cooker.**
- **Always blow-down (empty) the hot boiler at the end of the day and refill with water before quitting. Open blow down valve carefully and slowly.**
- **Never leave a hot boiler to cool completely without blowing down and refilling. This can cause a vacuum which can damage the pressure gauge or cause food or wash water to be sucked into the boiler from the cooker.**
- **Keep the boiler pressure above 25 psi and below 80 psi when normally producing steam for the cooker.**
- **Some safety release valves are set to 90 psi and some are higher. Confirm the setting on your safety valve. Make sure release valve is connected to a pipe and away from operators.**
- **If pressure approaches 90 make sure steam valves are open on both boiler and cooker. If that does not reduce the pressure, let some water slowly out of the blow down valve.**
- **If the safety release valve opens, do not panic about the extra noise. It will close by itself when it has released enough steam pressure. This is a normal and safe event but should be avoided if possible.**
- **Keep at least a medium size fire going at all times unless it is close to quitting time.**
- **Keep some water visible in the sight glass. Fill boiler when water drops below the bottom of the glass. Do not fill the boiler above the top of the glass.**

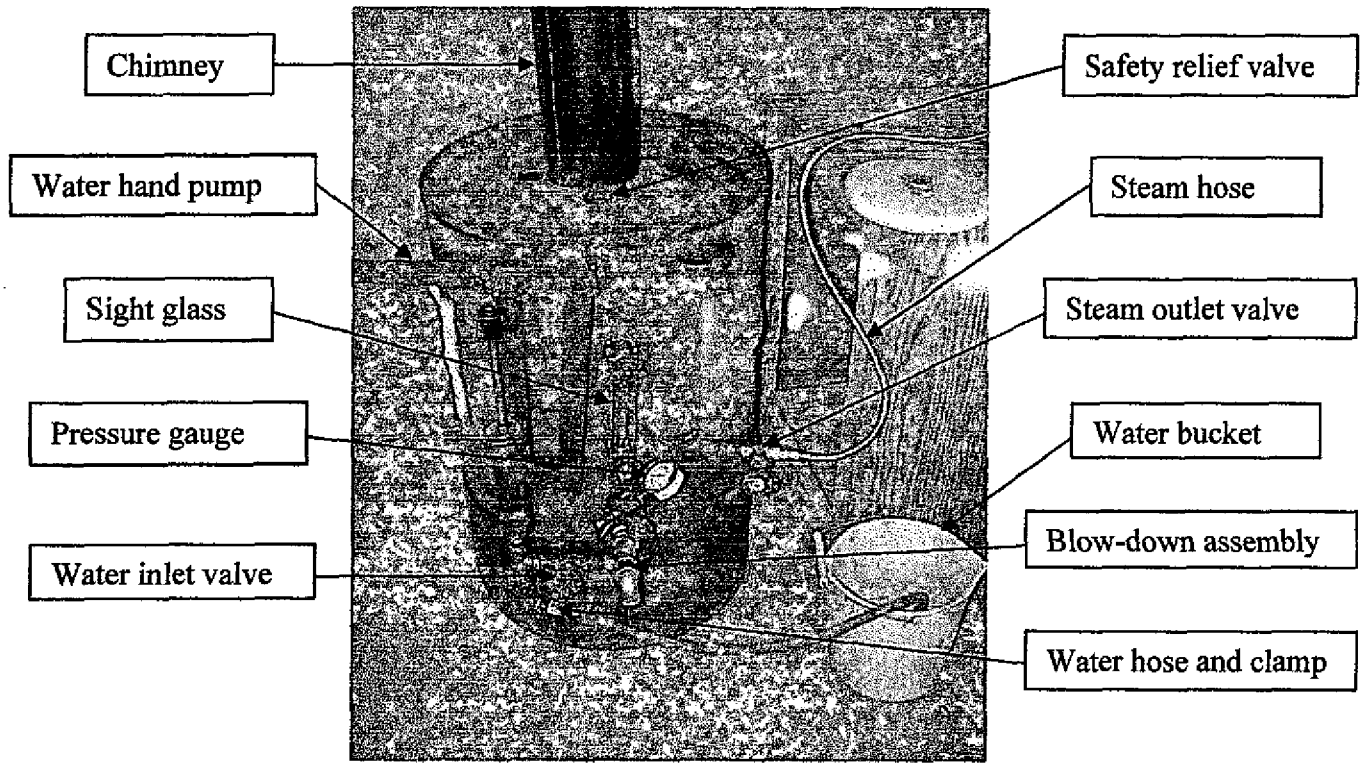
5. Steam Boiler Operation and Maintenance

5.1 Set-up

Follow all the directions for setting up the boiler as detailed in section 3.1

Note that the position of the boiler installation is critical. It must be just below or beside a chimney pipe which can exit the room through the roof or wall. There must also be some space to the left of the boiler to allow for wood to be fed into the firebox.

Attach and clamp a length of flexible hose to the water inlet. This can be from a source of running water or drawn from a nearby bucket.



Steam boiler components

5.2 Filling the boiler with water.

Open the water inlet valve (just above the water inlet). Begin pumping water into the boiler. Check to see if pump is actually drawing water. **If it is not, the pump may need to be primed when it is dry.** Pouring a bit of water on top of the large nut at the top of the pump may be enough to create an air lock and eliminate the need to open the pump. If this does not work and the pump must be primed, loosen the large pump nut at the top of the pump, using the

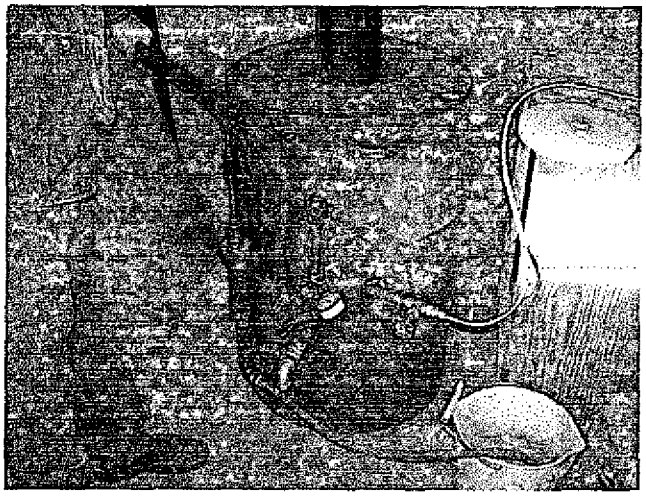
special water pump wrench supplied. Fill the pump with water and close the nut again securely. Continue pumping until water appears in the sight glass. **Fill the boiler to a point <u>near</u> the top of the sight glass, but do not fill it completely. If it is filled completely, it may be filled higher than the glass and cannot be checked to see if it is overfilled. It may also cause water to exit with the steam.** If it is overfilled, drain some water out by opening the blow-down valve at the bottom of the boiler directly below the sight glass.

When the water is filled enough, close the water inlet valve until water needs to be pumped in again.

Loosening boiler water pump nut

Water pump components

Pumping water into the boiler with the hand pump



5.3 Starting the Fire

Make sure that the food to be cooked will be ready when the boiler fire is started.

Make sure that the chimney connections are good through to the building exterior.

Start the fire in the firebox with a small amount of fuel. For the first time, make only a small fire to learn the boiler operation well. Keep extra fuel ready so that the fire can be continued for the whole cooking process.

Observe the pressure gauge regularly. This is the only way to be sure of the effect of the fire and the readiness of the boiler to begin processing steam.

5.4 Operating the boiler / maintaining correct pressure.

The operating pressure should be kept approximately between 25 psi and 50 psi during the cooking process.

When the boiler pressure gauge shows over 25 psi, the cooking process can begin. With the food to be cooked already in the cooker, open the steam outlet valve on the boiler, and also **gradually and partially at first, open the steam inlet valve on the bottom of the cooker.** If it is fully opened for too long, the pressure in the boiler may drop below the minimum of 25 psi. Pressure will begin to drop in the boiler so make sure that the fire is enough to keep the pressure up above 25.

If the pressure drops below 25 on the boiler, close the steam outlet valve, and wait for the boiler to heat and build pressure. This may require extra fire if the

fire is too small. However, you can normally regulate this with the cooker inlet valve if the boiler pressure will not stay above 25, and there is enough fire.

If the pressure in the boiler rises to above 50, even while the steam outlet valve is open and steam is being released to the cooker, reduce the pressure in the boiler by simply pumping in additional water with the hand pump.
In the unlikely event that the boiler pressure cannot be reduced by pumping in water, some boiling water can be released by gently opening the blow-down valve at the bottom.

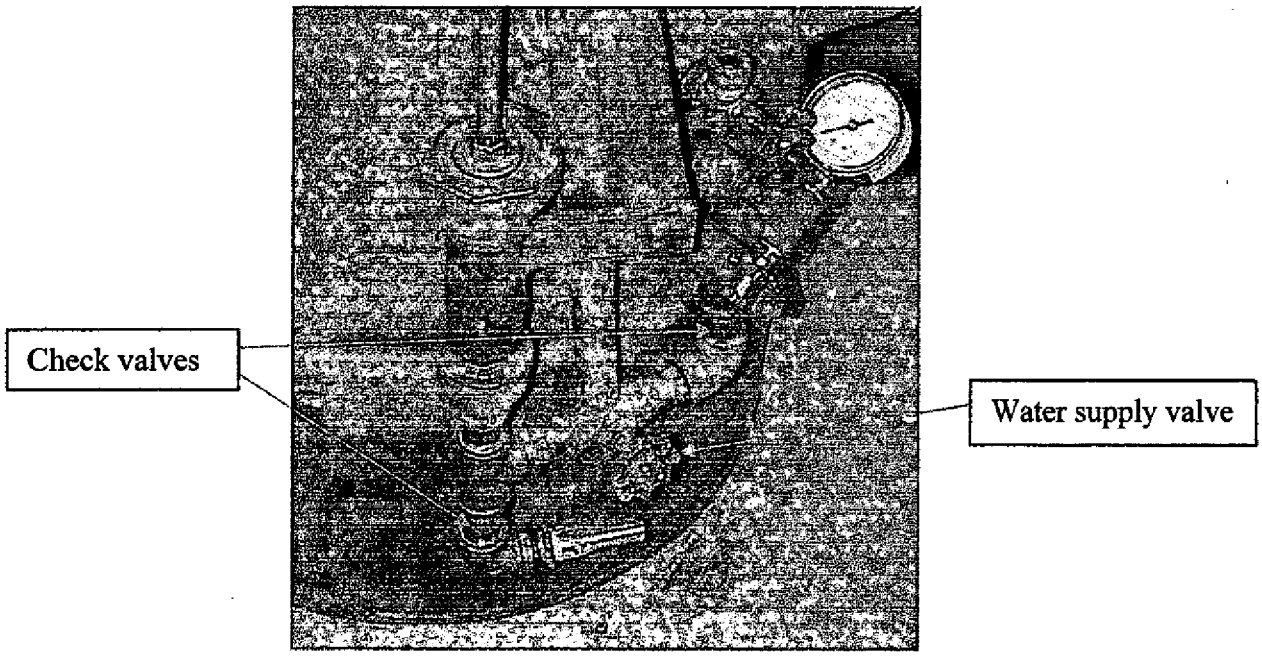
For ultimate safety purposes, there is a pressure relief valve at the top of the boiler. This valve will open automatically if the pressure in the boiler reaches 150 psi. However this should only happen if the boiler is neglected while there is still fire going strong in the firebox.

5.5 Maintaining correct water level

Always try to ensure that some water is visible in the sight glass. If the water level drops below the sight glass level, immediately pump in additional water up to near the top of the sight glass. Remember to open the water inlet valve each time. It is not absolutely necessary to close the water inlet valve after each filling, but it is recommended as an extra measure in case of failure of the in-line check valve. (See next section)

It is better to regularly add small amounts of water than to wait until the sight glass is empty. The boiler is more energy efficient when nearly full. Adding large amounts of water will quickly cool the boiler and may reduce the pressure so that the operators must wait for pressure to reach above 25 psi.

5.6 Check-valve information



The boiler is equipped with two check valves as shown in the above photo. Each check valve is installed to prevent water and steam from flowing in the wrong direction. The first check valve is below the pump and the second is to the right of the water supply valve. In case of failure of the second valve, the water valve can be closed to prevent reverse flow, however the check valve would need to be replaced.

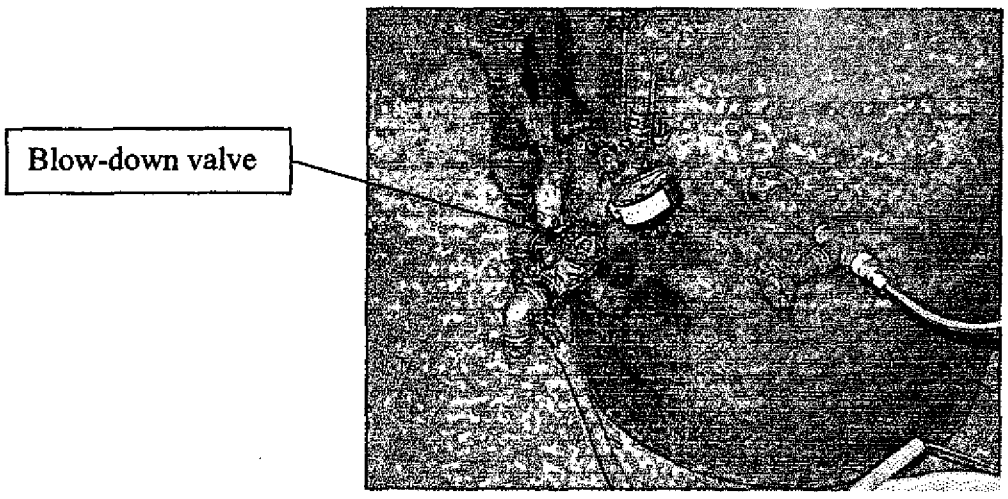
The two steam valves (on the boiler and cooker) must be left opened at the end of production and after blow-down to prevent a vacuum from forming in the boiler when the system cools. The boiler steam outlet can be left open again the next day, and left open in general (while closing the cooker steam inlet, particularly when building pressure in the boiler such as at start-up).

5.7 Boiler blow-down, regular cleaning

At the end of each day of operation, it is recommended that the boiler, while still hot, be emptied while under pressure. This is done by gently opening the boiler blow down valve at the bottom of the boiler. **This should be opened very carefully and slowly.** The boiling water and steam will be released into a vessel or a floor drain.

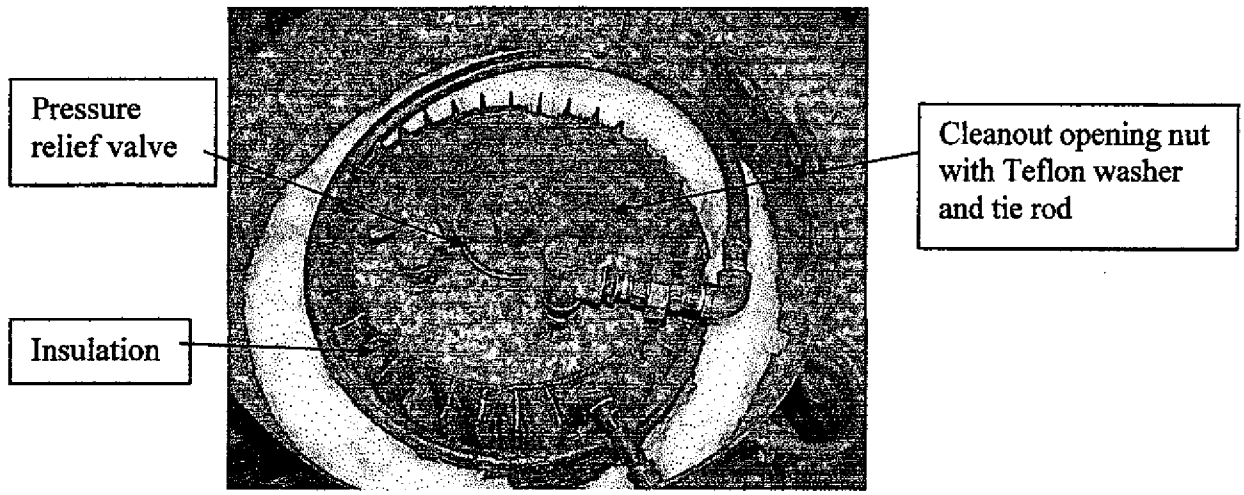
If this is not done daily, it should be done at least once per week.

After the blow down is complete, close the blow-down valve and refill the boiler with water so it is ready for the next day of operation. Keeping water in the boiler is preferred.



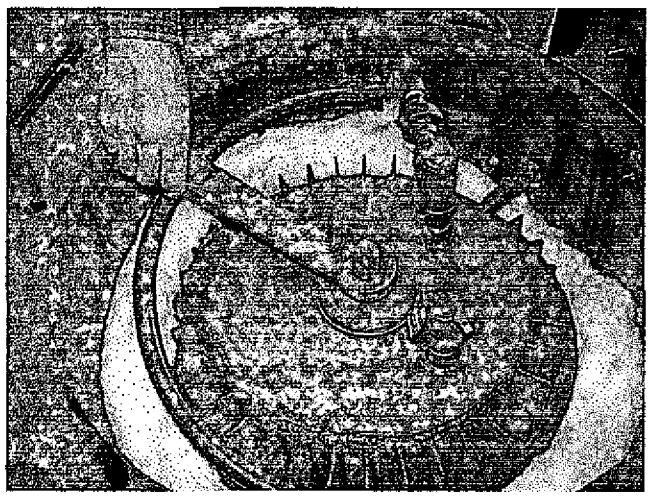
Boiler interior cleaning. (Performed monthly or less often, depending on water conditions and amount of operation)

This clean-out procedure is mainly to remove accumulated scale and deposit on the inside of the boiler. Regular daily blow-down should prevent the need for frequent interior cleaning.



Steam boiler with top cover removed

Remove the boiler drum cover. Using the clean-out nut wrench supplied with the system, loosen the top and bottom cleanout opening nuts on the boiler. The exact same configuration of nut + Teflon washer and tie rod is at the bottom of the boiler. It may be necessary to hold the bottom nut while removing the top.



Removing cleanout opening nut.
Same procedure on bottom of boiler.

Take extreme care to protect and save the Teflon washer which is immediately below the opening nuts on the top and bottom of the boiler. This prevents pressure leaks.

When the nut has been removed, gently knock the tie rod down and it will come out the bottom of the boiler. Remove the round plate to allow cleaning of the inside of the boiler. The bottom plate can be removed by tapping it from the inside with the tie rod. The top cleanout plate can also be knocked out with the loose rod pushed from the bottom.

When re-installing the round plates, tie rods and nuts with washer, it is necessary to wrap two layers of Teflon tape on the edge of the plates before they are re-installed into the boiler.

This page is to be copied and displayed in the area of the VitaGoat operation

COOKER OPERATION ALERT

- **Maximum capacity is 15 litres. For soymilk = 12 litres of water combined with mashed soybeans. Mix before loading cooker.**

- **Cook soymilk up to 110 C then close steam valve and release cooked product in one or two minutes.**

- **Cook fruit and vegetable purees, soups, sauces etc. up to 100 C then close steam valve and release cooked product.**

- **Never let the cooker pressure rise above 30 psi. At 40 psi the safety release valve will open – releasing hot food product.**

- **If the pressure gauge shows any pressure when the temperature is below 90 C, gently push the small lift pin button on the top of the cooker (use a spoon or tool). This will let unwanted air pressure out and let steam pressure build.**

- **For soymilk production: If the pressure gauge reaches 30 psi but the temperature has not reached 110, simply close the steam valve and wait a few minutes before releasing the food. This should never happen if the previous rule is followed.**

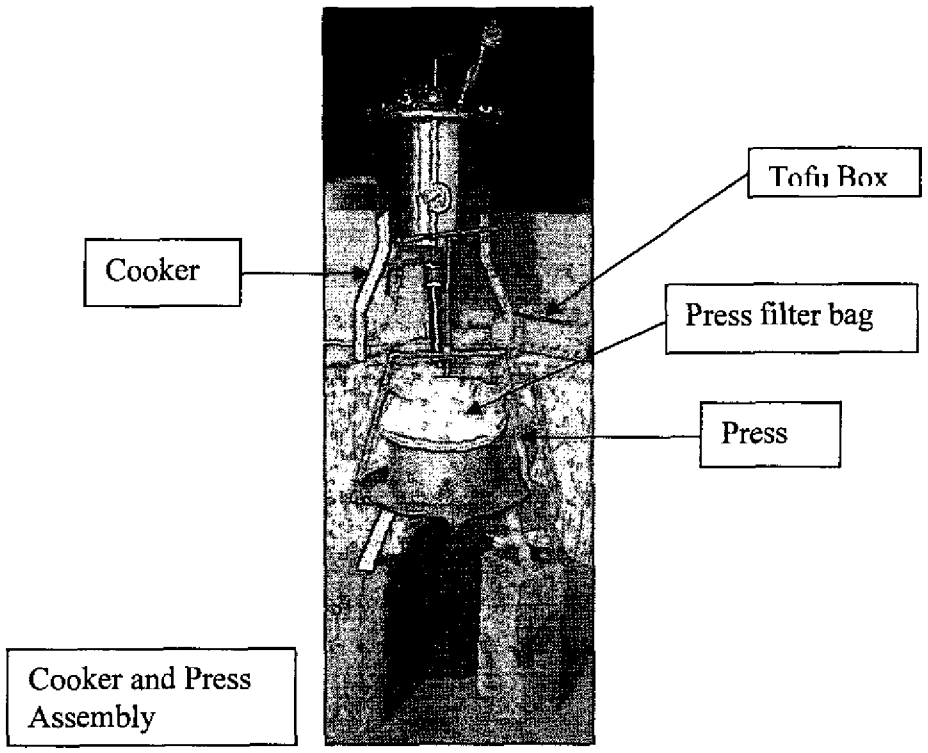
- **When releasing cooked food, open the main valve very slowly at first – then open it enough to allow a continuous flow. Never open the valve fully under pressure until the end (to be sure all the product is out.) Close valve immediately after emptying.**

- **Be prepared to partially or fully close the steam valve if the boiler pressure drops below 25 psi. Resume after boiler rises.**

- **For cleaning: Wash underside of lid sideways without turning upside down. Keep the two openings clear of food. Inside of cooker can be soaked with cool water and then washed with a mild detergent and water. Use a long brush through the outlet.**

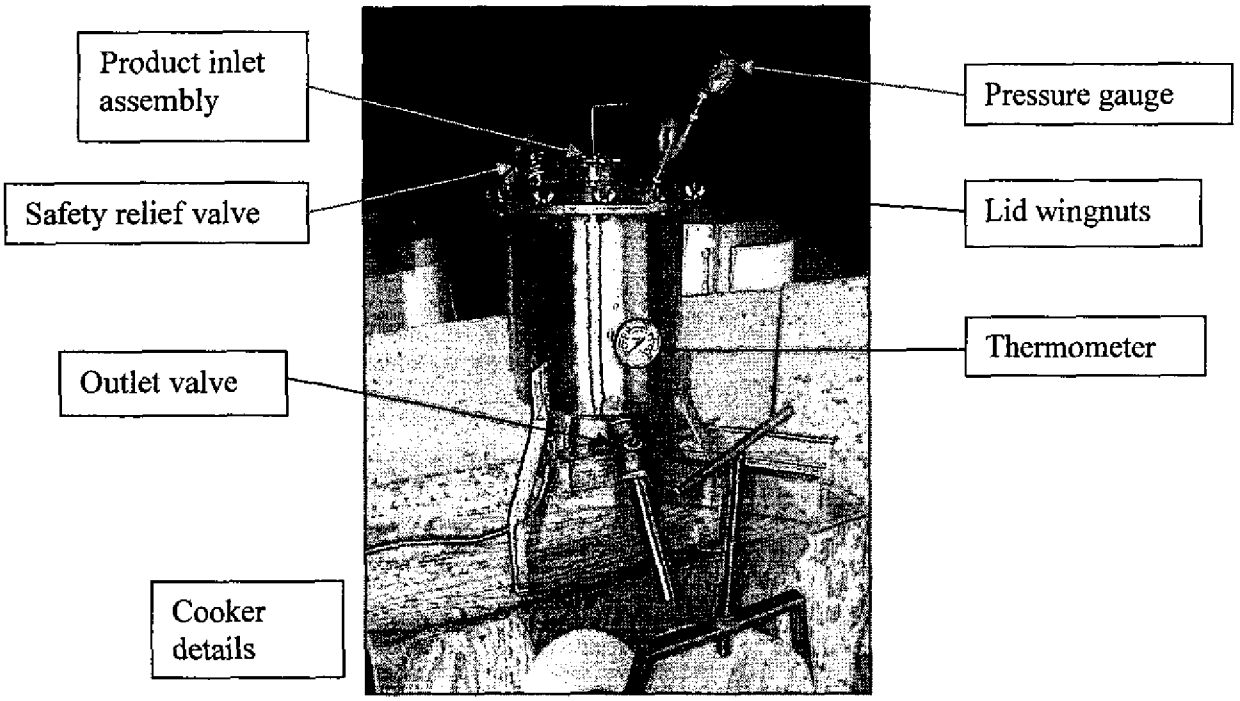
- **Make sure steam valve is closed to prevent wash water being sucked into boiler from possible vacuum in cooling boiler.**

6. Pressure Cooker, Press and Tofu Box

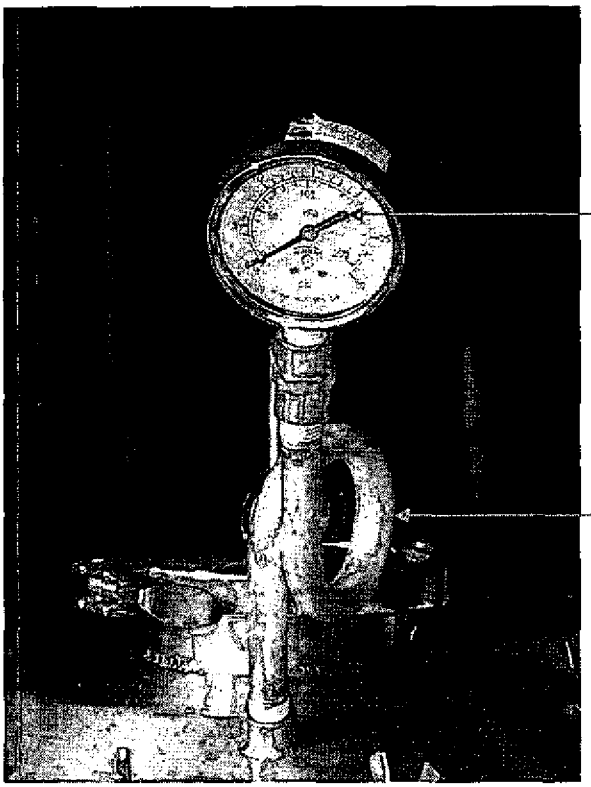


6.1 Cooker Details

Before operating the cooker, become familiar with the exterior and interior details as shown in the photos below.

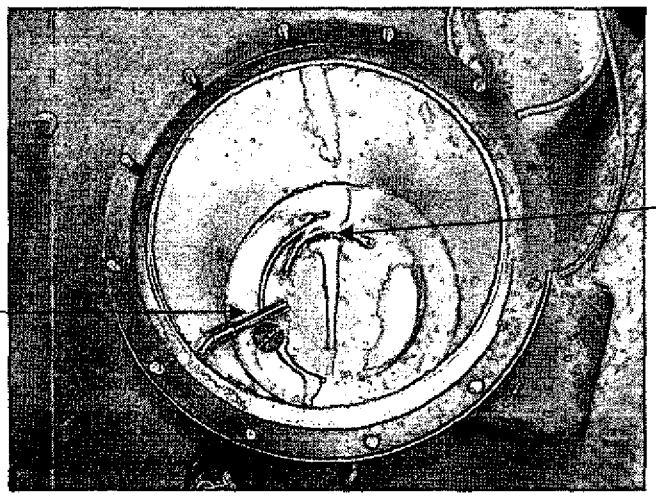


To open the cooker, simply remove the lid wingnuts and carefully remove the top and place it so that the pressure gauge does not get damaged. **If the pressure gauge is not installed with a "pigtail" connection as shown, this must be installed, using Teflon tape for the connections.**



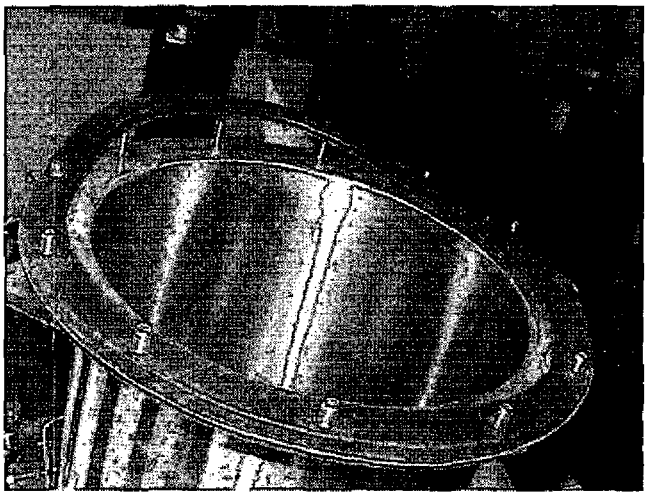
Cooker pressure gauge assembly

When the lid has been removed, note the interior, including the steam diffuser and the thermometer well.



Cooker inside view

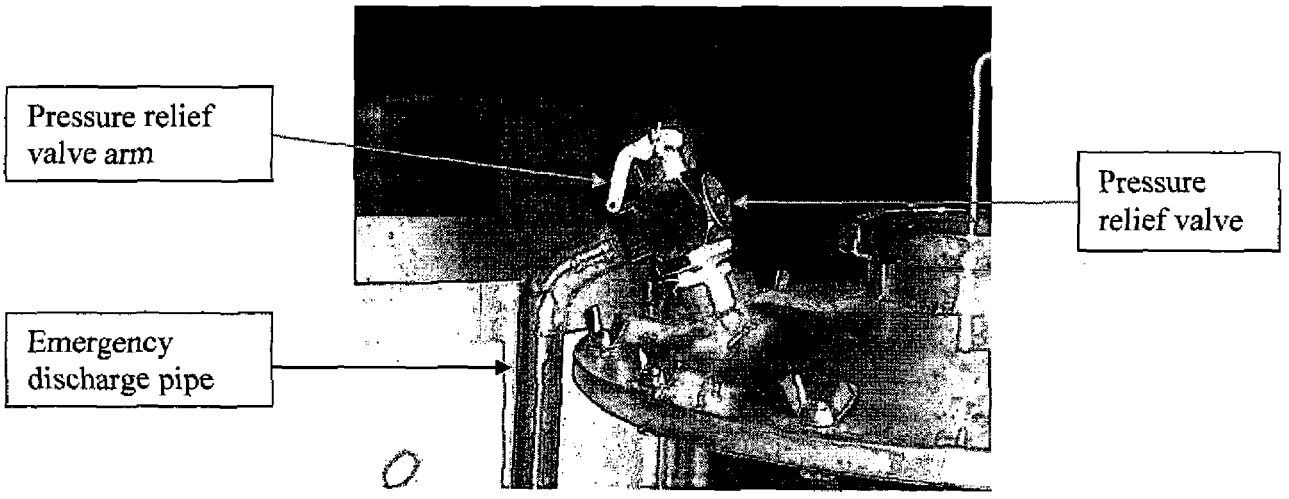
Pay special attention to the rubber lid gasket. This should be removed and oiled with an ordinary vegetable oil. This should be done several times per week during production, to allow long life and flexibility for the gasket.



Cooker lid gasket

This lid and the interior must be cleaned after every day of production and the components should be left open to dry out. Replace the rubber gasket and lid and close it with the wing nuts, finger-tighten securely. Do not use any tools.

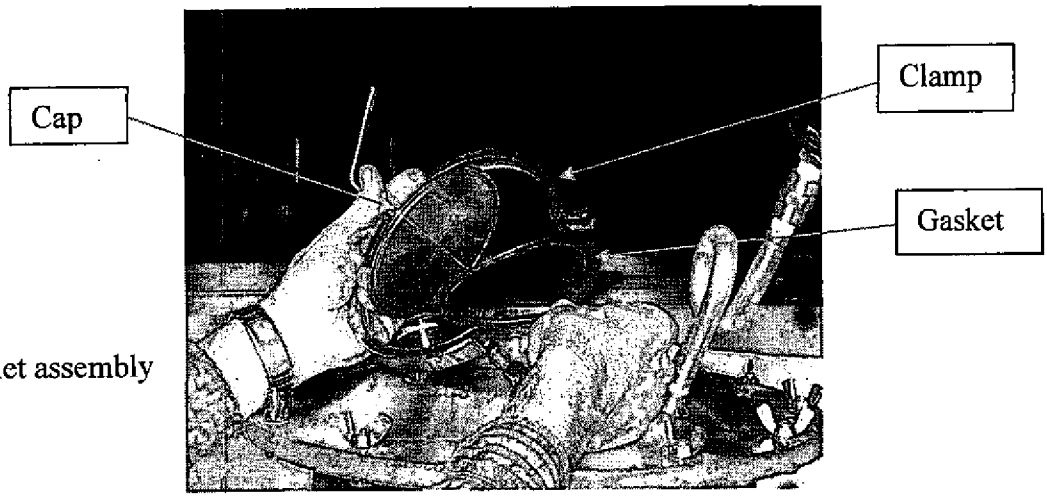
After replacing the lid assembly, pay special attention to the safety pressure relief valve assembly. Make sure the discharge pipe is attached and facing the rear of the installation. A bucket should be placed below it in case there is any release of cooked product due to an over pressure situation.



Pressure relief valve assembly

During each cleaning, the underside of the pressure relief valve must be checked and cleaned so that it does not become obstructed with food. It can be gently cleaned with a brush and flushed through by opening the valve with the valve arm. The underside of the pressure gauge assembly must also be cleaned.

Open the cooker product inlet by removing the clamp. Under the steel cap is another rubber gasket. This must also be oiled occasionally for maintenance.



Cooker product inlet assembly

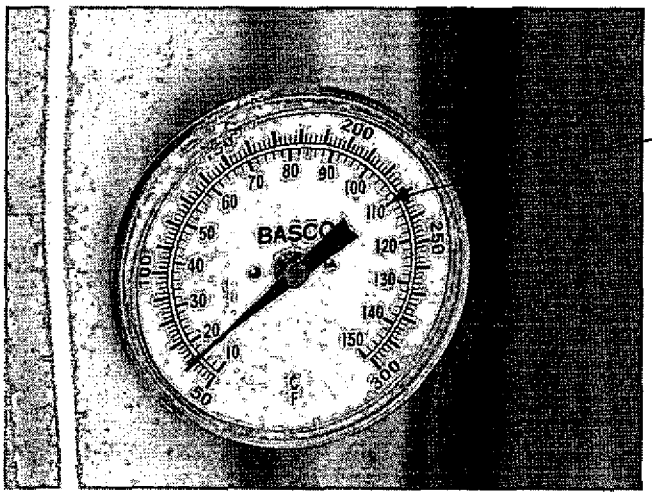
The mill hopper can be used as the cooker product inlet hopper as well

After the food products and water are added, close the product inlet assembly and finger-tighten the clamp.

6.2 Thermometer and pressure-cooking details.

Note the thermometer. **Together with the pressure gauge, it must be checked frequently during operation**. The ideal soymilk production temperature is between 105 C and 115 C. Temperatures higher than this can spoil the flavour of the soymilk, and temperatures lower will result in an undercooked product or will take extra time to cook.

To reach a temperature of above 100C the cooker must be under pressure. The temperature should be above 90C before pressure starts to show on the pressure gauge. **If the temperature is below 90 and there is pressure building on the gauge, release some air by pressing on the metal button on the top of the cooker lid. Use a tool to press the button as it will be hot. Also be very careful as some hot air and steam will be released.**



Cooker thermometer

Pour the ground or mashed food product already mixed with the right amount of water into the cooker. **Generally the combination of all should not be above 16 liters. For soymilk, use approximately 2 kg (dry weight) or 4 kg (soaked beans) together with approximately 12 liters of water.** This ratio can be varied to local preference, but it is better to make a rich milk which may later be thinned, than to make the product too thin.

Place the product inlet assembly (gasket cap and clamp) on the top of the cooker.
When the boiler pressure gauge shows over 25 psi (preferably higher – around 50psi), the cooking process can begin. With the food to be cooked already in the cooker, open the steam outlet valve on the boiler, and also open the steam inlet valve on the bottom of the cooker. If, the pressure in the boiler drops below the minimum of 25 psi, then temporarily close one of the steam valves until the boiler

pressure is higher. Pressure will ordinarily begin to drop in the boiler so make sure that the fire is enough to keep the pressure up above 25.

6.3 Checking Boiler

At the same time as the cooking begins, the operator or a second person must frequently check the boiler to see if the water needs to be added, or if the fire is too low or high. After some experience, it becomes more of a routine and the optimum balance of fire and water levels is reached for the needs of the production. Normally, when the steam valves are closed the pressure in the boiler will build more quickly so between cooking batches, when the valves are closed, the boiler should be monitored closely. If the boiler pressure begins to reach 80 psi or more, add some cold water with the pump to reduce the pressure If this is not enough, then the fire should be reduced. **The boiler also has a pressure safety relief valve, but it does not open until 90 psi or 125 psi (depending on the setting shown on the valve model), and this pressure should not be approached normally. If pumping water does not reduce the pressure then carefully release some water from the main blow-down valve on the bottom of the boiler.**

6.4Completing Cooking / Filtering

Continue injecting steam into the cooker until the desired temperature has been reached. **Always check the pressure gauge on the cooker while adding steam. It must not be allowed to exceed 35 psi, because at 40 psi the safety relief valve will open and discharge boiling hot product out the pipe at the rear.**

When the desired cooking temperature and time has been reached and the product is ready for release, make sure that the filter press has been prepared by having the filter bag installed over the edge of the perforated cylinder. Also have a clean bucket or other vessel placed under the spout of the press.

Release the cooked product very slowly at first. It is hot and under pressure and will be released dangerously if the cooker outlet valve is opened to quickly or too far.

In the case of soymilk or other products which must be filtered such as fruit or vegetable juices, release all the product into the filter bag. After some time when most of the liquid has passed through the filter, close the filter bag by twisting it and placing the top of the bag down, with the pressing plate above it. Press the remaining product out of the filter press by turning the nut.

In the case of sauces, soups, purees or other products which do not need filtering, release the finished product directly into a bucket or other vessel.

Immediately upon emptying the cooker into the press, the next batch of food should be ready to put into the cooker. **Make sure all pressure has been released from the cooker and then only open the top of the cooker food inlet assembly. Do not completely rely on the pressure gauge to confirm this, but also be sure that the cooker outlet valve was fully open before opening the top.**

6.5 Next Batch / Shutting Down

Finally, make sure the cooker outlet valve has been closed before putting the next batch of food in.

Repeat the cooking process, after checking fire level, water level and ensuring pressure in the boiler is above 25 psi.

At the end of production there should be a blow-down and refilling of the boiler. If this is not done then the two steam valves (on the boiler and cooker) must be left opened to prevent a vacuum from forming in the boiler when the system cools. It is always best to refill the hot boiler with fresh water before finishing. Then it will also be ready for the next day. The boiler must never be stored empty as excessive rusting will result.

6.6 Cleaning the Cooker & Press

The lid of the cooker should be **removed carefully and placed so there is no damage to the pressure gauge.** Remove the inlet clamp assembly and wash the inlet lid and gasket.

Clean the underside of the main cooker lid, paying special attention to the openings for the pressure safety relief valve and the opening to the pressure gauge. **When finished washing the lid, leave it in an upright position for draining so no water or waste rests in the openings.**
Remove the main gasket and clean. Lightly **oil both gaskets with vegetable oil periodically after they are dry. This will extend their life.**

Wash out the inside of the cooker and the inside of the main outlet valve and pipe. Use cold water at first to release cooked-on soymilk, then warm water with soap to finish the washing.

Wash the press assembly. Soak the filter bag and wash it.

Leave all components open to dry before re-assembling.

6.7 Tofu Box

See the tofu box drawing in section 10.
Tofu preparation instructions are shown in section 8.

7 a) Production of Cooked Foods

1. Soymilk and soymilk derivatives

See section 6 (especially 6.3) and section 8, for details on production of soymilk and derivatives.

2. Tomatos

a) Choose tomatos in good condition, however over-ripe ones can be used if not spoiled.
b) Wash the tomatos.
c) Cut into quarters.
d) Put through the fruit mill to make tomato puree or tomato juice.
e) Cook in the cooker at 90C for 5-10 minutes (after adding other ingredients).
f) Follow all cooker instructions from section 6, except no cooker pressure necessary. Lid can be closed loosely and not locked.
g) Remove from cooker. Press / filter if juice is desired.
h) Put into jars and sterilise if necessary (see later section on sterilisation.)

3. Mangos and other tropical fruits (guava, passion fruit , etc.)

a) Choose fruit in good condition, however over-ripe fruit can be used if not spoiled.
b) Remove skins and pits.
c) Cut into quarters
d) Put through the fruit mill to obtain puree, nectar or juice.
e) Cook at 90C for 5-10 minutes.
f) **Follow all cooker instructions from section 6, except no cooker pressure necessary. Lid can be closed loosely and not locked.**
g) Press and filter if juice is desired.
h) Put into jars and sterilise if necessary (see later section on sterilisation.)

7 b) Production of Dry Foods

1. Peanuts or other nuts to make a paste or nut-butter

a) Shell the nuts.

b) Roast lightly over a fire.

c) Grind with the cycle grinder. Adust the grinder plates with the screw, and the pulley / belt to change the product consistency and force of grinding. Lightly push and stir inside the grinder hopper with a wooden dowel or bar (if necessary). Put the nut butter into containers.

2. Grains and cereals (corn, sorgum millet, etc.) and soybeans for meal or flour

a) Dehull if possible.

b) Grind with the cycle grinder. Adust the pulley / belt to obtain the correct speed and force of grinding. Lightly push and stir inside the grinder hopper with a wooden dowel or bar (if necessary).

c) Adjust the consistency of the flour or meal with the regulating screw on the grinder.

d) Pass the product through the grinder a second time for increased fine texture of flour or meal.

3. Dry-roased soya (to make soya coffee)

a) Roast the soybeans over a fire until they blacken.

b) Grind with the cycle-grinder. Lightly push and stir inside the grinder hopper with a wooden dowel or bar (if necessary).

c) Adjust the consistency with the regulating screw on the grinder.

4. Shea nut (karité) paste

a) Shell the shea nuts.

b) Roast on the fire.

c) Process the nuts with the cycle-grinder. Adjust for the correct consistency.

d) Process the paste into butter with the traditional method.

5. Coffee

Use the cycle grinder to grind roasted coffee beans. Adjust for consistency.

6. Cocoa

Use the cycle-grinder to make cocoa paste.

8. Ensuring Soymilk Tastes Good + Tofu / Yogurt / Okara
(and also of high nutrition quality and functionality)

1. Introduction
Soymilk quality is comprised of many factors, with taste being one of the most important (along with texture and mouthfeel, colour and sanitary condition). It further follows that if the soymilk does not taste good, then any products made from it will not either (whether it is tofu, yogurt, mayonnaise, etc) The following will thus focus on those aspects of production that affect soymilk taste.

2. Cooking Procedure
a) Soymilk should not be over-cooked or undercooked. In either case, the product will be less nutritious as well as of lower quality taste and functionality. If over-cooked the product will have a distinctive over-cooked taste. If undercooked, it will have a "green" or more raw, beany taste.

b) The proper procedure should be carefully followed from the instructions in the operating manual. This involves a correct combination of cooking time and temperature. Soymilk should be cooked up to a temperature of 110 to 115 C (**But not higher**). It can be immediately released from the cooker if the temperature has risen above 110. If the pressure in the cooker is getting too high, the steam can be turned off and the cooking can be finished by holding the temperature for about one to three minutes at, or near 110C.

3. Ensuring The Boiler Water / Steam Is Clean
a) A water filter should be used in the line leading into the boiler in all cases where the water supply is suspected of having impurities. Any particles visible in the water will have an adverse effect on boiler operation and lifetime, but will also affect the quality of steam being injected into the soymilk. Bacteria is not usually a problem due to the high temperatures, only murky or cloudy water leaving sediment.

b) The boiler should be blown down (cleaned out under operating steam pressure with the appropriate valve attached for this). This should be done ideally at the end of every day of operation, but at least once a week. If it is only done weekly, several cycles of boiling and releasing the boiled water and steam should be done until the operator sees clear water coming through. Failure to do this will seriously affect the life and operation of the boiler and will cause impure steam to be injected into the soymilk. Less frequently, the boiler can be opened and cleaned inside.

4. Bean Cleaning and Soaking
a) Insufficient cleaning and rinsing affects soymilk quality. After a manual and visual check for foreign particles, the dry beans should be completely immersed in water momentarily and then the water drained off.

b) Under or over-soaking will negatively affect soymilk taste and yield. Correct soaking time is approximately 8 hours for cool water (15-20 C) and less for warm water (Maybe only four to five hours at 25C or higher.) Beans can be soaked up to 10 hours to assist in production planning where overnight soaking is indicated for the morning production. However in such cases it is important that the soaking water remains relatively cool. Any soybeans found floating on top of the water should be

discarded. Properly soaked beans will split in two when squeezed between the fingers and the inside halves should be smooth, not concave, which indicated under soaking, and the inside bean colour should be uniform.

c) After the soaking period, the water should be drained off and the soaked beans should be rinsed again briefly with a little water before cooking.

d) To conserve water, the soaking and rinsing water can be kept for later washing of the equipment and watering of gardens if appropriate.

Beans which are soaked much too long will start to ferment. This will be evident by either a great deal of foam resting on the top or possibly by a fermented smell coming from the soybeans. If this happens then the beans will not produce soymilk.

5. Formulation of Soymilk

The chart below is a guideline for quantities of water for the cooker and dry weight soybeans. (Soaked soybeans will more than double in size and weight).

Soyfood	Fresh Water	**Dry weight** Soybeans
Soymilk Beverage	12/13 liters	2 – 2.2 kg Depending on desired soymilk thickness
Tofu & Yogurt	12/13 liters	2.2 kg

a) The cooked soymilk should have added to each batch (approx. 14-15 liters) a small quantity of salt (about two tablespoons) and a larger quantity of sugar (at least one cup – 250 ml) according to taste. For children add two cups of sugar per batch. This procedure is the single most important factor in making soymilk taste acceptable to the general public. Cow's milk contains lactose and is therefore naturally sweet. Therefore it is necessary to add sugar to bring soymilk up to a similar sweetness as accepted by the public. This procedure is necessary also for making yogurt but not tofu.

b) Other flavourings may be added as available including chocolate, vanilla and fruit syrups and purees. When using fruit products it is important that they are not too acidic or they will cause curdling (separation) of the soymilk.

c) Using a refractometer (if available) to check the Brix reading (dissolved solids) is helpful to ensure that the soymilk is neither too thick, nor too thin. The ratio of soaked beans to water is slightly different for tofu and soymilk for drinking. Also, the yield of extraction from the soybeans is reduced if the product is too thick, because this causes too much protein and other nutrients to remain in the okara.

6. Cleaning of Equipment

a) The cooker, grinder and filter press should be cleaned daily and thoroughly. Failure to do so will adversely affect the taste of the product, but also the life and safety of the equipment. For example, an unclean safety release valve can fail easily and make the system dangerous to operate.

b) The system should be pressure cooked with water only at the beginning of each day of production. It should be heated and pressurized until the pressure relief valve opens automatically. This helps sterilize the system and tests the pressure relief valve, which is the primary safety feature of the system.

c) When making tofu, the resulting whey (yellowish or greenish water remaining when the curds are removed) should be kept for cleaning the cooker and press. The whey helps to dissolve the sticky protein residue from the inside of the system.

d) When cleaning the system it is important to use **cold water** at first. Cold water dissolves the protein - milk residue much better than hot water. Warm water can be used with detergent as a final step.

e) Filter cloths and bags should be washed at the end of the day with soapy water. It is not enough to merely rinse them.

7. Storage and Handling of Soymilk and Tofu

a) To avoid growth of bacteria and product spoilage, soymilk must be kept at a temperature of under 5 C or over 60 C. This is necessary when the soymilk is not being consumed the same day it is produced.

b) Tofu should be kept in cold water, unless in a vacuum sealed container, and refrigerated. The water should be changed after several days to extend the shelf-life.

c) Recipients of soymilk who bring their own containers should be instructed to rinse them in boiled water before bringing them.

d) Soymilk will normally keep for up to a week when refrigerated properly, however this can be increased to several weeks or more by filling clean containers when the soymilk is hot (above 70 C).

8. Making Tofu

Tofu quality and yield depend primarily on the coagulant and the procedure used for coagulation. Other factors include soymilk temperature, coagulation time and the way the tofu curds are handled when transferring for pressing. Our experience has shown that a smoother tofu texture will occur if the curd pieces are larger rather than smaller, and if the curd transfer for pressing is gentle and does not break up the curd pieces.

The tofu can be used in a number of recipes as a stand-alone or as a meat substitute or complement, as a soft cheese substitute, and other foods. The procedure described below is for making "semi-firm" or "firm" tofu.

The tofu-making process is as follows:

a) Take fresh soymilk while still hot, at a temperature between 80-85C, and place in a large pot that has a cover.
b) Prepare a coagulant solution of 500 ml of hot water mixed with **Calcium or Magnesium Chloride or Calcium or Magnesium Sulfate (Epsom salts)** to produce a 10% strength. This is equivalent to approx. 4Tbsp (60mL) of food grade powder in 500 ml of hot water. Alternately, a 9% **Acetic acid** (vinegar) solution can be used. It is also possible to use **Citric acid** (30g in half liter of hot water) This is an excellent coagulant for firm tofu but may be harder to find.
c) Stir the soymilk vigorously then stop and immediately pour 2/3 of the coagulant into the agitated soymilk. Then stir only 2-3 times in the opposite direction to ensure that the coagulant is well dispersed in the soymilk. ***Do not* stir much after the coagulant is added as it will break up the larger curds and it will be harder to produce well-formed tofu.** Cover the vessel with the lid.
d) Let stand for ten minutes, then lift the cover and separate the upper layer slowly to check curd formation.
    - If the curd is of good quality (clear curd clumps have formed with a yellowish-greenish liquid between them), then cover the vessel and allow to stand for 10 minutes.
    - If the curd formation is weak, and whitish soymilk liquid is still present, add the remaining coagulant solution and stir 2-3 times very gently. Cover the vessel and allow to stand for 10 more minutes.
e) The coagulation process is complete when large curd pieces or flakes float in a light yellow transparent whey.
f) Remove most of the whey by using a colander and a ladle (the whey can be kept as an excellent cleaner for the system) and transfer the remaining curd to a cheese-clothed lined pressing box.
g) For soft tofu, press for 30 – 60 minutes with a 5 kg load; For firm tofu, press for 60-90 minutes with a 10 kg load. Note though that the relative firmness of the tofu also depends on type of coagulant used, coagulation temperature and the protein level of the soymilk base.
h) Cut the pressed tofu into 6-8 blocks and cool in water for 30-60 minutes, preferably with water circulation. This carries away most of the coagulant flavours that remain in the tofu. It also improves the shelf life.
i) Refrigerate any portions that will remain unused for more than 4 hours.

9. Soy Yogurt

Soy yogurt is made almost the same way as cow's milk yogurt.

a) If dairy yogurt cultures are not available, simply use some existing dairy yogurt as a starter, making sure that the cultures in the yogurt are "live" cultures.

b) Add 30 g of sugar and about 1 g of salt for each liter of soymilk. The sugar is necessary because soymilk does not contain the milk-sugar, lactose. Sugar is necessary to "feed" the natural bacteria which results in the yogurt.

c) Heat the mixture to 45C. (Or wait until the fresh soymilk cools to 45C) Add 2 Tablespoons of local yogurt (again, made from live cultures) or use yogurt starter culture if available. Mix thoroughly.

d) Ideally, the mixture should be made in a metal pot or bowl. Cover it and keep it warm, about 35-40 degrees C for 8-12 hours. It can be kept warm by carefully insulating the closed pot with heavy blankets. This is not necessary in a hot climate of over 35 degrees. However, at below 35 on a warm, sunny day, the closed pot can simply be placed outside in the direct sun for 8 or more hours. A shorter incubation time will produce a more liquid "drinkable" yogurt, while a longer incubation time will produce a firmer yogurt.

It is possible to stir in fruit puree to the soya yogurt after it is made if for drinkable yogurt, while the fruit can be placed in the bottom of a cup or container before incubation if the final product is firm yogurt.

Refrigerate finished product if not consumed same day.

Save some yogurt as a starter for the next cycle of production.

10. Okara (soybean fiber residue)

The non-dissolved fiber that remains after filtering out the soymilk is called "okara". It is approximately 75-80% water and still quite hot after it is freshly produced. This warm, moist mixture of mainly fiber, protein and carbohydrates must be used fairly quickly for human consumption since the okara is an ideal breeding ground for bacteria. In warm climates, the okara must be consumed or transformed within 4-6 hours. If used as an animal feed, the okara can be kept for approx. 1 day.

It is possible however to inexpensively dry okara, and thus greatly increasing its shelf life, by placing the moist okara in direct sunlight on a screen and turning it over a number of times throughout the drying period. The dry okara can thus be kept for a period ranging from a few weeks to several months, depending on its moisture level (the lower the moisture, the longer it will last).

Okara has a smooth texture, akin to fine moist sawdust, and has a pleasant slight cereal taste. Like tofu, okara will take on the flavour of the ingredients with which it is blended, while adding fiber and protein to the food. Examples include soup thickener, meat extender and patties.

Okara is ideal to use in baking applications, where it can replace 10-15% of the regular bread or pastry flour, while giving the regular dough up to 50% more protein. It has also been shown to extend the shelf life of bread products by a day or more.

Soybean Storage

1. Introduction

There are two ingredients that are necessary for making soymilk base – water and soybeans. In order to have a good tasting product, one must then use good quality water and soybeans. The proper storage of soybeans is particularly important since it not only affects the soybean quality, but improper storage can waste soybeans by making their yield go down (% of protein that can be extracted from them) or by simply making them unusable.

2. Moisture Content

When soybeans are harvested from the field, they have a certain moisture level, dependent on the growing season conditions, bean variety and harvesting conditions. Soybeans can be harvested at moisture levels below 20%, but they must be stored at 14% moisture or lower. This moisture level is achieved after harvesting usually by mechanically drying the beans, but it must be maintained during storage. This moisture level is the single most important aspect in extending the effective life of soybeans. The following table provides guidelines regarding this:

Moisture Content %	Effect on soybean quality
11	Can safely be stored for long periods of time, but there is a risk of mechanical damage to the seed
12 – 13	Can be stored for up to 2 years
13 – 14	Can be stored for up to 1 year
14 – 15	Can be stored for up to 6 months
15 –16	Can be stored for up to 4 months
16 and higher	Quality will rapidly deteriorate

As can be seen then, even small variations in moisture can greatly affect the storage life of soybeans. For this reason, it is necessary to have a way of verifying the moisture level of the beans at each site.

3. What happens if soybeans become moist

If the moisture level becomes too high (which is common during the humid, summer months), soybeans actually can start to germinate, which affects their chemical structure, and has the following consequences:

a. soymilk yield goes down (liters of soymilk made from 1 kg of dry soybeans)
b. soymilk taste will be adversely affected, with a range of slightly "off" flavour to tasting rancid as the oil within the soybean begins to spoil.

For these reasons, it is important to store soybeans correctly, primarily to avoid high moisture levels.

4. How to store soybeans

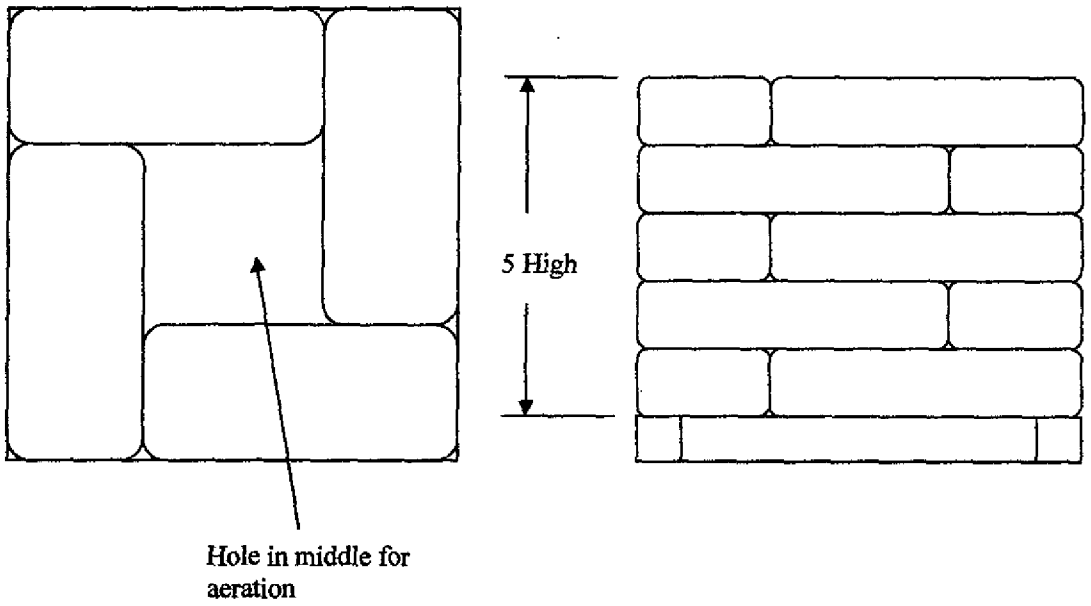
Soybeans are received at the recipient locations either in bulk (loose) or in bags.

i) Bulk (loose) soybeans

Soybeans in this case can be stored in a large steel or plastic vessel that is open to atmosphere, but that is covered, to avoid any possibilities of water directly falling on them. The room in which they are kept should have forced air ventilation (an exhaust fan) and should preferably be kept cool (ideally, not above 25C in the summertime). In no case should the relative humidity be more than 70%. The beans should periodically be stirred to promote drying. It goes without saying then that soybeans should never be kept in the same room where bean soaking or soymilk production takes place.

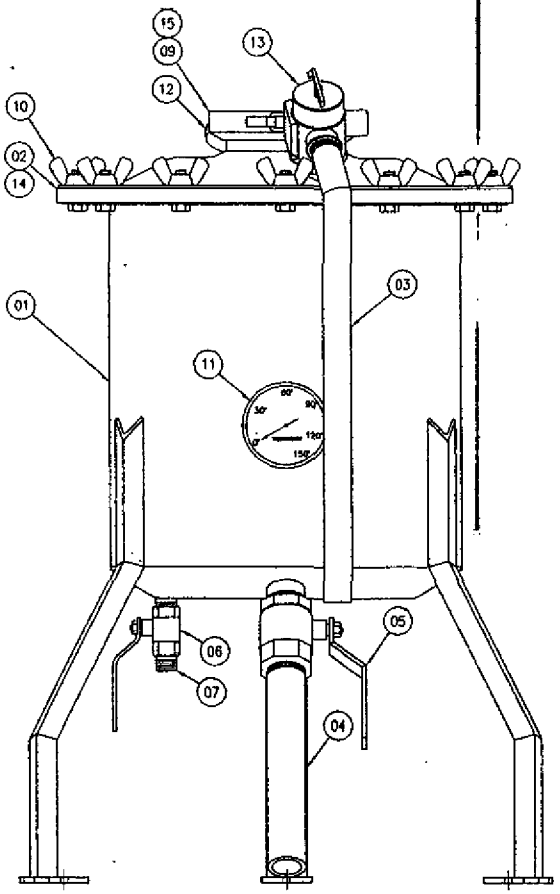
ii) Bagged soybeans

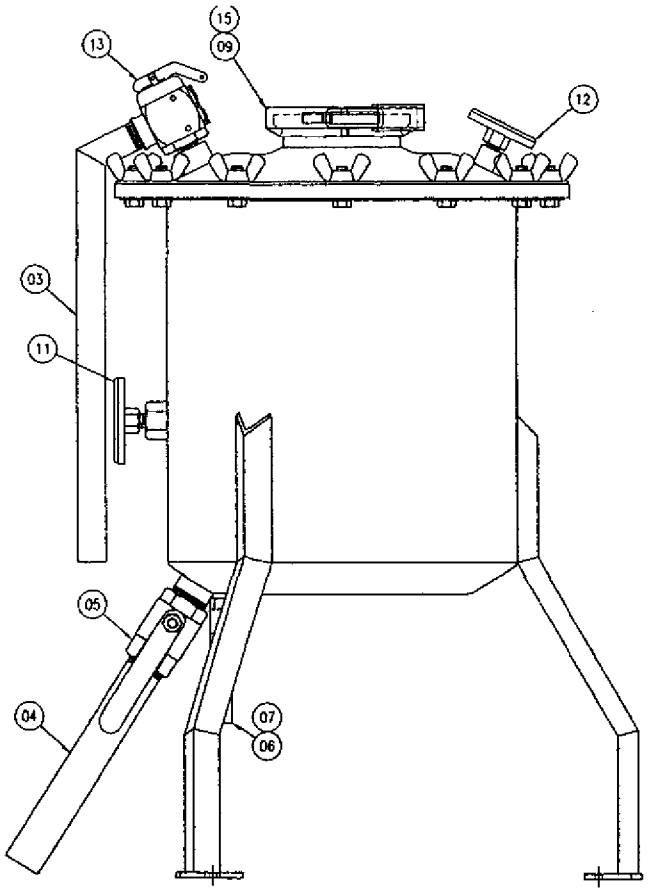
There is a specific and correct way to store soybeans in bags to facilitate drying and avoid overheating of the soybeans. This is by placing the bags on a wooden pallet so that there is a hole left in the center of the configuration to let air circulate. The bags should be stacked no more that 5 high on the pallet (see illustration).



5. Other Factors

a) Soybeans must be kept in rodent and insect-free areas since these will render the beans unsanitary and loss due to rodents may in fact be large. For this reason, soybeans should be kept in a closed room without access to the outside and with access door(s) closed at times when not in use.
b) If bagged, the bags should not be broken to prevent spillage and waste.
c) The "first in – first out" principle applies, where the oldest soybeans always get used first, so that all soybeans are used in the chronological order that they were received in.





ALL		ALL	SEE DRAWING PC-AX	
ITEM	QTY	DWG	DESCRIPTION	MATERIAL

Malnutrition Matters
FOOD TECHNOLOGY SOLUTIONS

Ottawa, Canada
www.malnutrition.org

TITLE: PRESSURE COOKER ASSEMBLY

DRAWING NUMBER: PC-A

DATE:	SCALE:	PAGE:
15/12/03	1/4=1	1/1

NOTE :
1-All dimensions in inches
2-Tolerances ±1/16" unless indicated

ITEM	QTY	DWG	DESCRIPTION	MATERIAL
15	1	STD	# 40MPU-4 GASKET (JOINT CLAMP)	BUNA-N
14	1	STD	ø15 1/4 OD x ø13 3/8 ID x	BUNA-N
			ø 14 1/2 BC x 3/8 THICK LID GASKET	
13	1	STD	3/4 MALE-3/4 FEMALE PRESS. RELEIVE VALVE	BRASS
12	1	STD	1/4 NPT 2 1/2" 0-30 psi PRESSURE GAGE	SS
11	1	STD	ø3" 0°-150° THERMOMETER 2 1/2" TIP	SS
10	12	STD	3/8 -16 UNC WING NUT	SS-304
09	1	STD	# 13MHHM-4 CLAMP	SS-304
08	1	STD	# 16AMP-4 (4" CAP CLAMP)	SS-304
07	1	STD	3/8 NPT x 1" CLOSE NIPPLE	SS-304
06	1	STD	3/8" 600 WOG FULL PORT BALL VALVE	BRASS
05	1	STD	1" 600 WOG FULL PORT BALL VALVE	BRASS
04	1	EP-01	1 " EMPTYING PIPE	SS-304
03	1	VP-A	VENT PIPE ASSEMBLY	SS-304
02	1	PCC-A	PRESSUR COOKER COVER ASSEMBLY	SS-304
01	1	TK-A	TANK ASSEMBLY	SS-304

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TITLE
PRESSURE COOKER ASSEMBLY

DRAWING
EXPLODED VIEW

DRAWING NUMBER
PC-AX

DRW:	APPROVED:	DATE:	SCALE:	PAGE:
R.R.	B.H.	15/12/03	3/8-1	1/1

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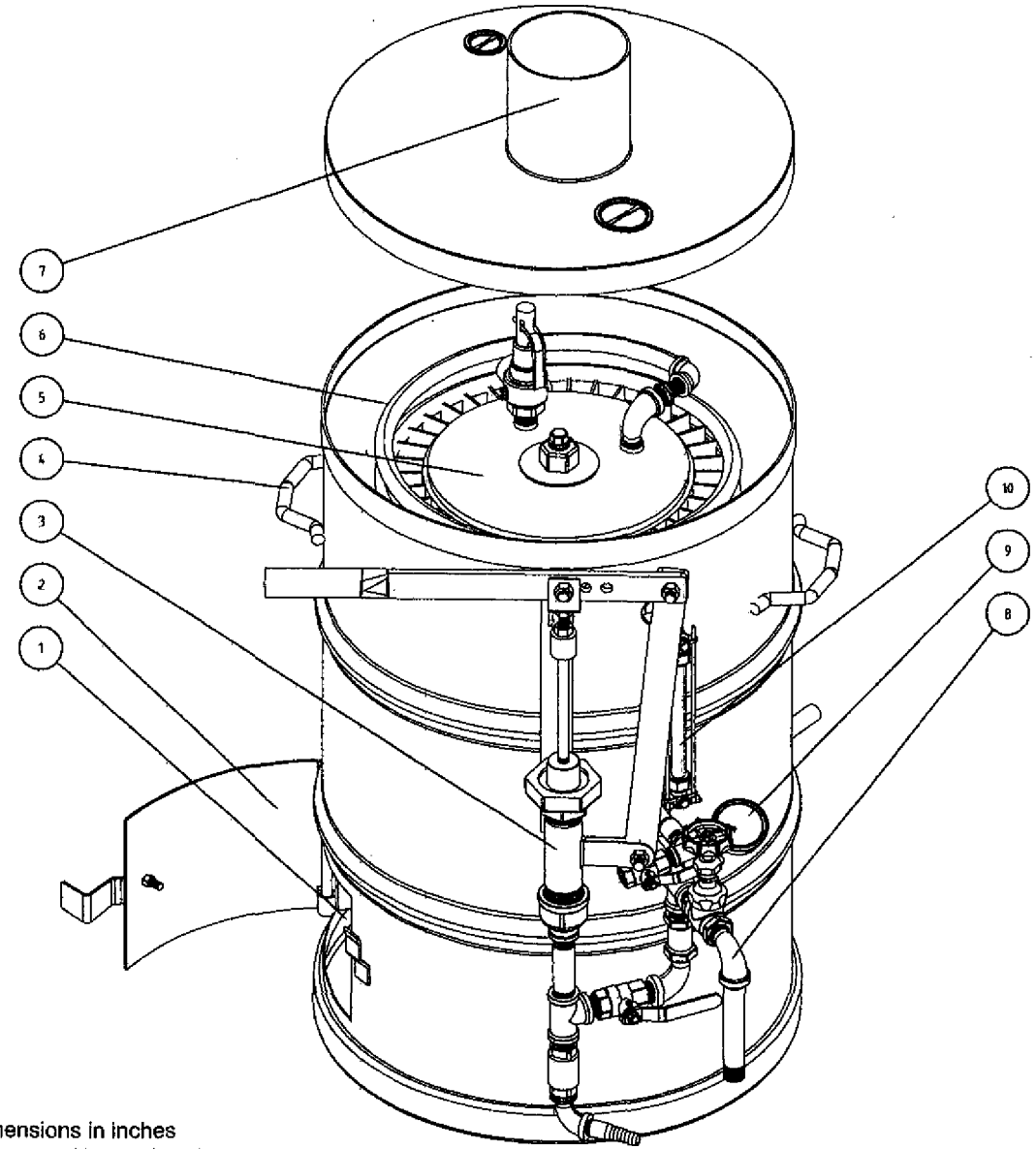

NOTE :
1-All dimensions in inches
2-Tolerances ±1/16" unless indicated

ITEM	QTY	DWG	DESCRIPTION	MATE
10	1	GGVA-02	SEE GAGE GLASS VALVE ASSEMBLY	
9	1	PDA-02	SEE PIPING DIAL ASSEMBLY	
8	1	PA-03	SEE PIPING ASSENBLY	
7	1	CD-01	SEE CAP DRUM	
6	1	SC-01	SEE STEAM COIL	
5	1	BA-02	SEE BOILER ASSEMBLY	
4	1	DA-02	SEE DRUM ASSEMBLY	
3	1	PA-02	SEE PUMP ASSEMBLY	
2	1	FDA-02	SEE FURNACE DOOR ASSEMBLY	
1	1	CR-01	SEE COMBUSTION ROOM	

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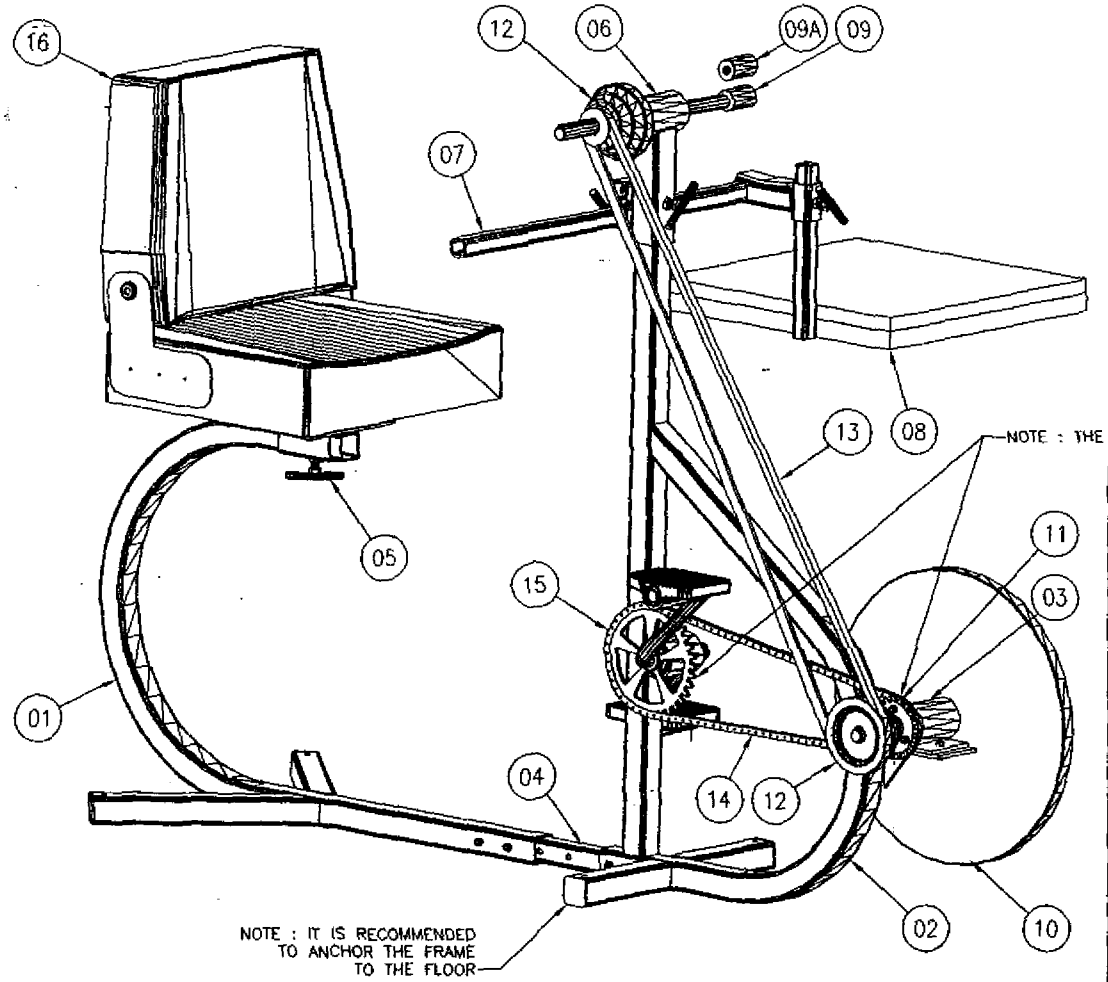
TITLE
ASSEMBLY

DRAWING NUMBER
A-01

DATE:	SCALE:	PAGE:
01-10-2004	INDICATED	



NOTE : THE ROTIO BETWEEN THE GEARS IS 2:1

ITEM	QTY	DWG	DESCRIPTION	MATERIAL
16	1		SEAT ± 16" LARGE x 14" x 17" HEIGHT	
15	1		STD BYCICLE 38 THEET PEDAL GEAR	
14	1		BYCICLE ROLLER CHAIN x ± 48" LG.	
13	1		" V " BELT 4L 810 x ± 80" LG.	
12	2		STD 4"x2" x 3/4" BORE PULLEY	
11	1		STD BYCICLE 19 TEETH PINION GEAR	
10	1	FW-01	FLYWHEEL	
09A	1	GCU-01	GRAIN CONDITIONER UNION	
09	1	JEU-01	JUICE EXTRACTOR UNION	
08	1	TS-ASS'Y	TABLE SUPPORT ASSEMBLY	
07	1	GAS-ASS'Y	GRINDER ARM SUPPORT ASSEMBLY	
06	1	MSA-ASS'Y	MAIN SHAFT ADJUSTMENT ASSEMBLY	
05	1	SA-ASS'Y	SEAT ADJUSTMENT ASSEMBLY	
04	1	BJ-01	BASE JOINT	
03	1	SSA-ASS'Y	SPROCKET SHAFT ADJUSTMENT ASS'Y	
02	1	FB-ASS'Y	FRONT BASE ASSEMBLY	
01	1	RB-ASS'Y	REAR BASE ASSEMBLY	

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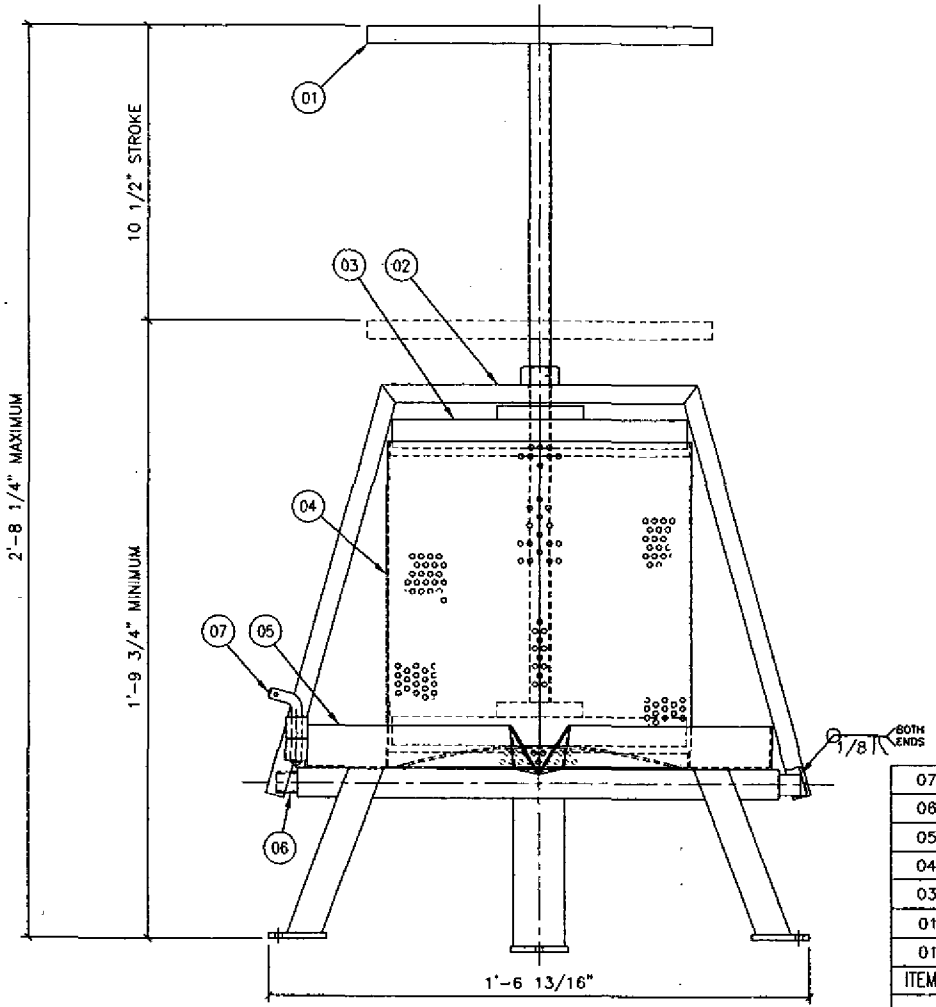
TITLE
VITAGOAT GRINDING ASSEMBLY

DRAWING NUMBER
VG-ASS'Y

DATE:	SCALE:	PAGE:
2/10/03	INDICATED	1/1

NOTE :
1-All dimensions in inches
2-Tolerances ±1/16" unless indicated



PRESS ASSEMBLY

SCALE : 1/4=1

ITEM	QTY	DWG	DESCRIPTION	MATERIAL
07	1	LP-01	LOCKING PIN	SS-304
06	1	HO-2	HINGE INNER PART	SS-304
05	1	PAN-A	PAN ASS'Y	SS-304
04	1	SCR-01	SCREEN ASS'Y	SS-304
03	1	PP-A	PRESSING PLATE ASS'Y	UHMW
01	1	HO-A	HOLDER ASS'Y	SS-304
01	1	SC-A	SCREW ASS'Y	SS-304

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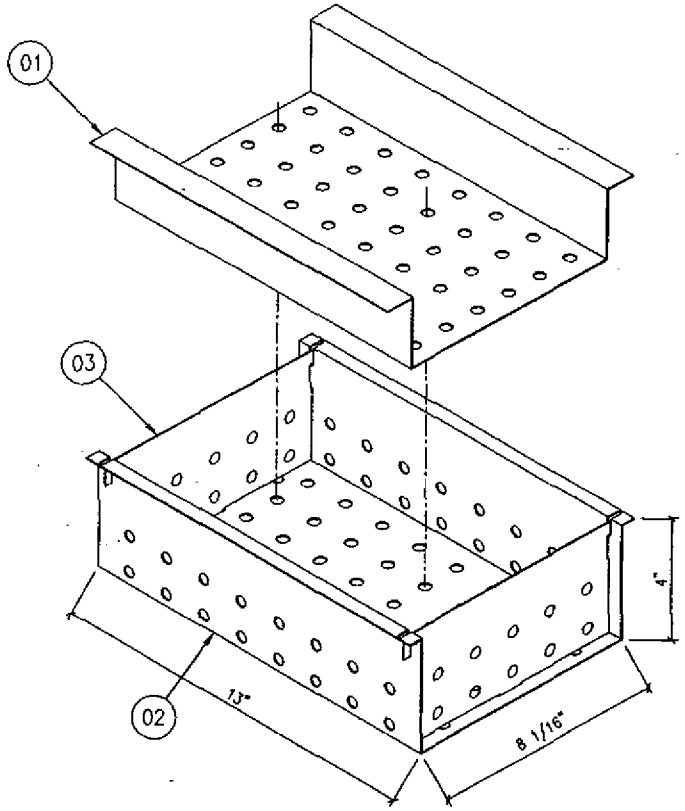
TITLE: PRESS ASSEMBLY

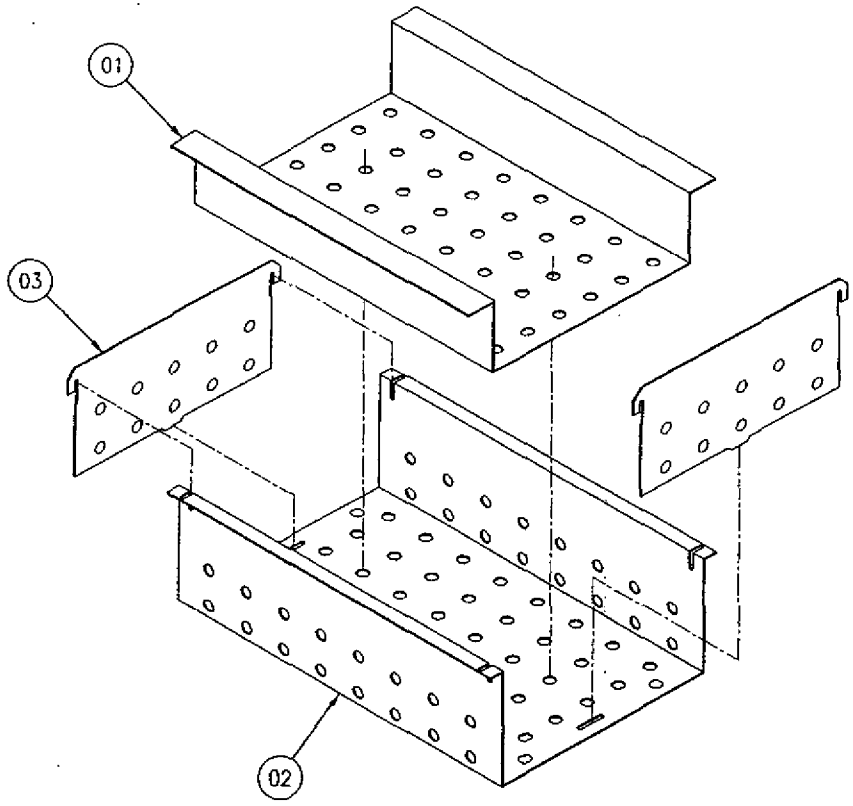
DRAWING NUMBER: PRESS-ASS'Y

DATE:	SCALE:	PAGE:
15/12/03	INDICATED	1/1

NOTE :
1-All dimensions in inches
2-Tolerances ±1/16" unless indicated



TOFU MOLD-ASS'Y



TOFU MOLD EXPLODED VIEW

ITEM	QTY	DWG	DESCRIPTION	MATERIAL
03	2	TMEP-01	TOFU MOLD END PIECE	SS 304-2B
02	1	TMLP-01	TOFU MOLD LOWER PIECE	SS 304-2B
01	1	TMUP-01	TOFU MOLD UPPER PIECE	SS 304-2B

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TITLE: TOFU MOLD ASSEMBLY

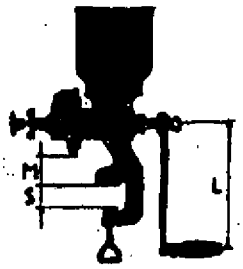
DRAWING NUMBER: TM ASS'Y

DATE:	SCALE:	PAGE:
9/01/04	1/2=1	1/4

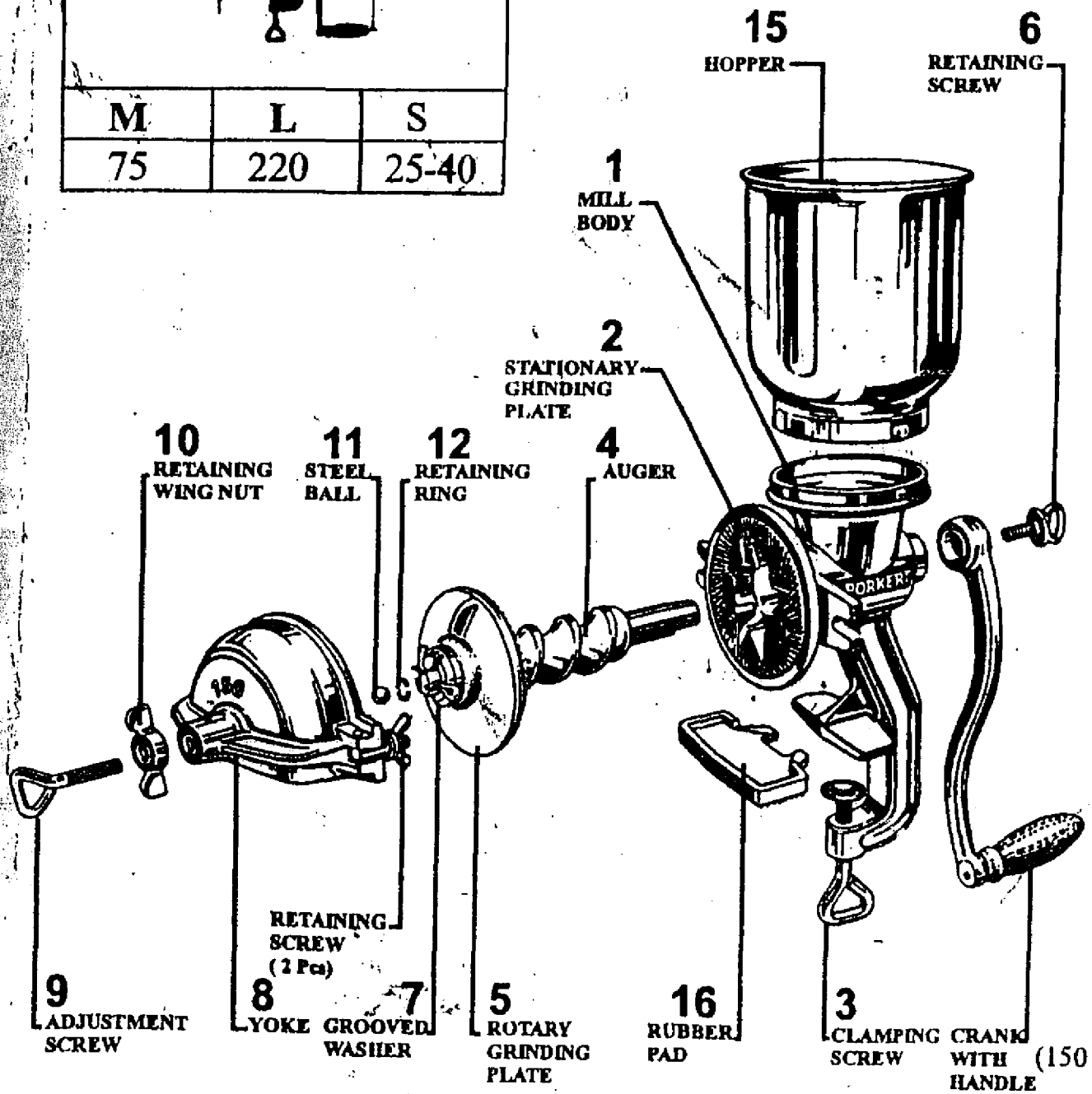
NOTE:
1-All dimensions in inches
2-Tolerances ±1/16" unless indicated

PORKERT®

150



M	L	S
75	220	25-40



Manual Grist and Flour Mill
Instructions
PORKERT® - 150

The PORKERT® Grist and Flour Mill is a manually operated appliance for household application, designed to be used for grinding grains and spices. The mill is manufactured of conventional cast iron using finishes fully compliant with the most stringent health safety standards for processing food.

The mill is shipped semi-assembled in a set of the following parts:

* mill body 1 with the stationary grinding plate 2 and the clamping screw 3.
* auger 4 with the rotary grinding plate 5 and grooved washer 7 retained by a retaining pin.
* yoke 8 with adjustment screw 9, retaining wing nut 10, steel ball 11, retaining ring 12 and retaining screw 13 with washers and wing nuts.
* crank 14 with handle and retaining screw 6.
* hopper 15
* rubber pad 16

Mill Assembly :

The mill must be assembled using the above parts.

* place the rubber pad on the foot plate and clamp the mill to a sturdy tabletop or counter.
* Insert the auger with the grinding plate into its channel in the body.
* Release the yoke adjustment screw, insert the yoke onto the auger shaft end and attach it to the body using the retaining screws and wing nuts after properly mounting the washers.
* Insert the crank onto the protruding auger shaft and install the crank retaining screw.
* Mount the hopper on the mill body top and lock it in place by turning it counter-clockwise.

After the initial assembly, the mill should be tested by running i without grains to dislodge and remove any extraneous metalli particles.

After this testing run, disassemble the mill and wash all parts in warm sudsy water and dry it thoroughly to prevent rust.

Grinding Adjustment and Operation :

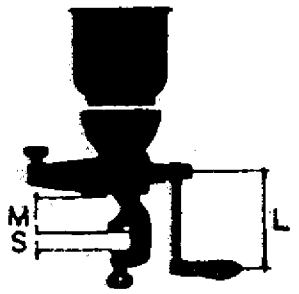
The meal coarseness obtained depends on the space between the two grinding plates. This space is adjusted by rotating the adjustmen screw 9 until the desired fineness is produced, and it is fixed by tightening the retaining wing nut 10. Once adjusted and fixed, the mil is ready for operation.

Maintenance and Cleaning :

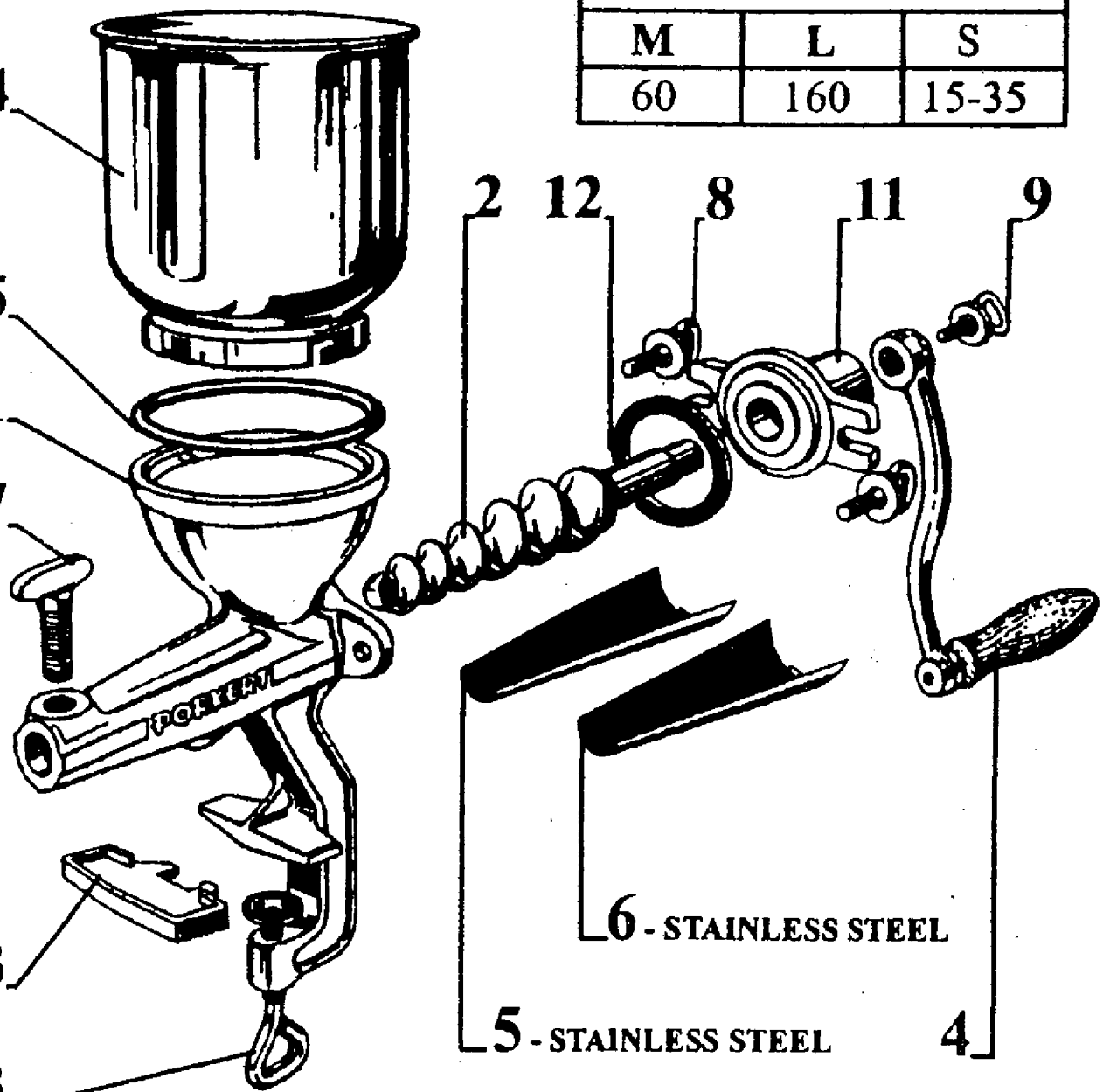
The mill requires no special maintenance. It should be dismantle after each use for washing and drying of its parts. Occasionally a few drops of mineral oil should be applied to the lubricating hole on top o the yoke.

PORKERT®

2A-model V



M	L	S
60	160	15-35



(2A - Model V-2)

GB

Operation Instructions for PORKERT• Juice Extractor Type 2A - Model V

The juice extractor is designed to make fruit juice or jam, to produce fruit or tomato purée, or to press juice out of grain sprouts.
Before using the device for the first time, dismantle it and wash all its parts with warm water with a small addition of dishwashing detergent to remove preservation oil from the surface, and rinse them with drinking water. Then assemble and adjust the device following the instructions given below.

Device Assembly and Adjustment

Insert the stainless strainer (5) or (6) into the body (1) so that it fits in the lower gap within the body. Depending on the kind of fruit being pressed,choose either the fine stainless strainer with holes measuring 1.1 mm in diameter,or the coarse stainless strainer with holes measuring 1.5 mm in diameter. The fine stainless strainer (5) is usually used for making juice or tomato purée, while the coarse stainless strainer for making jam.
Next, insert the worm (2) into the body, and fix the flange (11) together with the rubber washer (12) on its pivot. The flange (11) with its centring diameter must fit in the body (1). The flange correctly fitted must be fixed on the body with two screws (8). Tighten the screws gradually and by turns so that the rubber washer (12) is well - evenly tightened and the correct position of the flange (11) is ensured. Then attach the handle (4), and secure it with the handle screw (9). Then screw on the setting screw (7), put the rubber pad (13) on the foot of the unit (see the picture), and mount the unit on a desk by tightening the bracing screw (3) and use as a clamp. Finally, fix the hopper (14), with the packing ring (15) slid on, on the body cup, and turning right secure it.
Before you start to drain, regulate the pressure of the setting screw (7) to open a path inside the waste hole. It should be either totally loosened or screwed maximally up to 1/4 of the height of the waste hole. When the unit is full and the first portion of thin waste or pulp has passed once, regulate the setting screw again to allow thicker waste to flow freely out of the unit. Also in the course of pressing the texture of waste must be watched, and the setting screw (7) loosened or tightened if needed. However, be cautious about tightening the setting screw too much as it may result in clogging the unit. Depending on the kind of fruit being strained, the quantity of peelings, pips, stalks, etc., the tightening of the setting screw varies accordingly. When pressing currents for juice, it is recommended to leave their stalks or stems on, and to press them only in bunches at a time. This gives better results. When making tomato purée it is necessary to cut the tomatoes in halves. Juice flows out through a side drain, waste goes out the opening at the narrow end of the unit.
In case you push fruit into the device with your hand, you should exercise extreme caution.
After use dismantle and wash all parts with warm water, rinse with drinking water and dry carefully to prevent possible corrosion.
All parts can be obtained separately as spare parts.
We wish you full satisfaction with the product of PORKERT• trade mark.