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Research and Development of a Small-Scale,
Low-Cost Rice Bran Stabilising Unit

Vienna, Austria, 6 - 10 December 1976

ENGINEERING ASPECTS OF A SIMPLE LOW-COST RICE BRAN STABILIZER 1/

by

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FOREWARD

Within its work programme for 1976, UNIDO initiated a global programme of research and development geared to the design and manufacture of a prototype, low cost rice bran stabilizer suitable for manufacture and use in developing countries where rice forms a main factor of food consumption and agroproduction output. The stabilizing equipment is to be characterized by the following basic criteria:

1. Suitable as an attachment to existing small and medium capacity rice mills;
2. An effective stabilization process is to be carried out by technically simple and unsophisticated equipment suitable for manufacture in developing countries;
3. No steam consumption;
4. No electricity consumption;
5. The use of rice mill by-products (husks) as fuel;
6. As far as possible automatic function not requiring (expert) attendance;
7. Easy maintenance - not involving mechanical parts - and limited repairs.

Introduction

The development of rice bran stabilization equipment involves at least two technologies:

- Food technology to determine that the process developed effectively stabilizes the bran without destroying the nutriment contents the oil, vitamins etc.
- Engineering to design and develop machinery to efficiently and economically achieve the required stabilization.

In order not to duplicate information contained in other papers to be presented at the UNIDO AD HOC EXPERT STABILIZATION MEETING VIENNA 6 - 10 DECEMBER 1976, I will not consider the Food technology aspects but concentrate on the Engineering aspects. There are a number of processes which can be used to stabilize rice bran including:

(A) Dry Heat Treatment

(B) Moist Heat Treatment

(C) Chemical Treatment

(D) Insert Atmosphere

(E) Gamma Irradiation

This paper will only consider solutions to the problem by processes (A) & (B).

Brief Description of rice bran & the process of stabilization

Rice bran, with a protein content of about 10 - 15% and a vegetable oil content of 18 - 20%, is an important raw material for the extraction of rice bran edible oil for human consumption as well as for the production of rice bran meal, a valuable component of protein animal feed.

Some 8 mill, tons of this rice bran remain unused in the rural areas of developing countries, because of rapid deterioration during storage and transportation - operation, caused by a biological encymatic process, splitting the oil contained in the bran into free-fatty acids and glycerin, thereby not only destroying the neutral oil but quickly turning the bran into a valueless waste product. In order to maintain its value as a raw material for the production of edible oil and protein feed meal and to make optimum use of it, the rice bran needs to be stabilized by a special heat treatment combined with a certain dehydration effect.

The Use of Rice Mill by-products
(Husks) as a fuel

To comply with the UNIDO suggest that rice mill by-products and (husks) are used as of fuel. Only this method of heat generation is considered in the paper. This fuel has the advantage of being readily available at the required place, and is not a finite energy sources, also provided the combustion is complete does not create excessive atmosphere pollution when burning.

The availability of heat from rice husks

From each 100 kg of Paddy approx. 20 kg of rice husk are obtained when it is milled the free volume is approx. 6 cu. ft. but can be compressed to approx. 2 cu. ft. When burnt this liberates 220,000 to 264,000 Btu. (Assuming complete and efficient combustion)

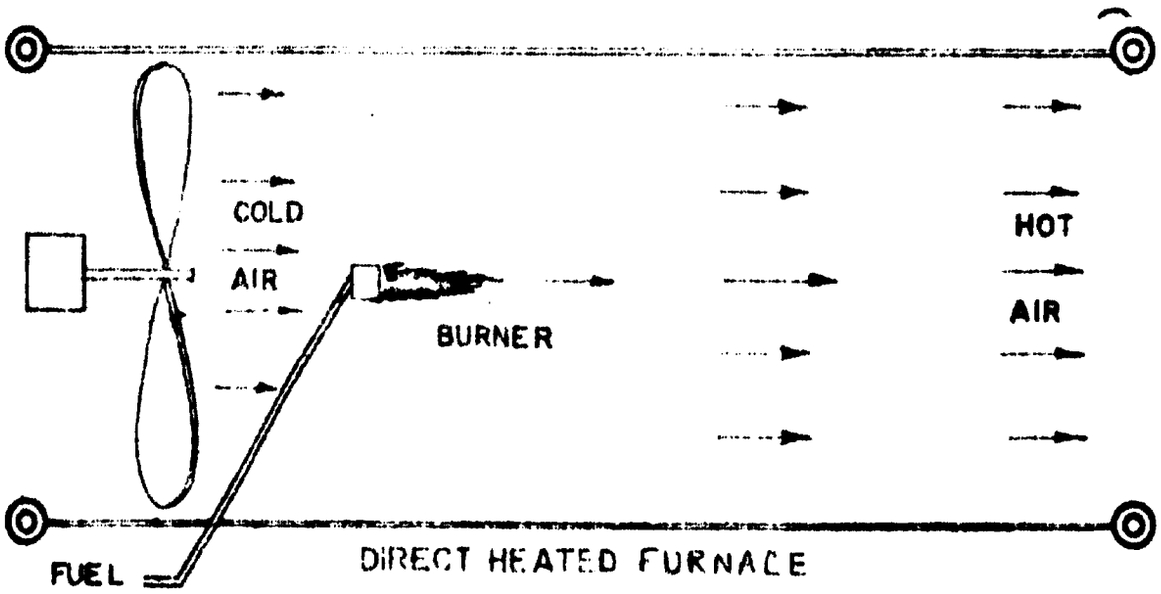
The designs of simple furnaces for burning rice husks

Provided rice husks are burnt with complete and efficient combustion the flue gases are clear and do not contain noxious fumes. Tests when using these flue gases to dry paddy have not indicated that the colour and odor of the milled rice changes appreciably after drying. To obtain complete and efficient combustion the best method appears to be to start with a hot fire and add the new fuel in small and regular qualities this way minimum smoke is generated. The appearance of the ash indicates the efficiency of combustion, completely burned husks will be white if not completely burned they will be black.

Some designs of Furnace

Furnaces can be of two main types:

(a) Direct heated in which the flue gases are used for heating;

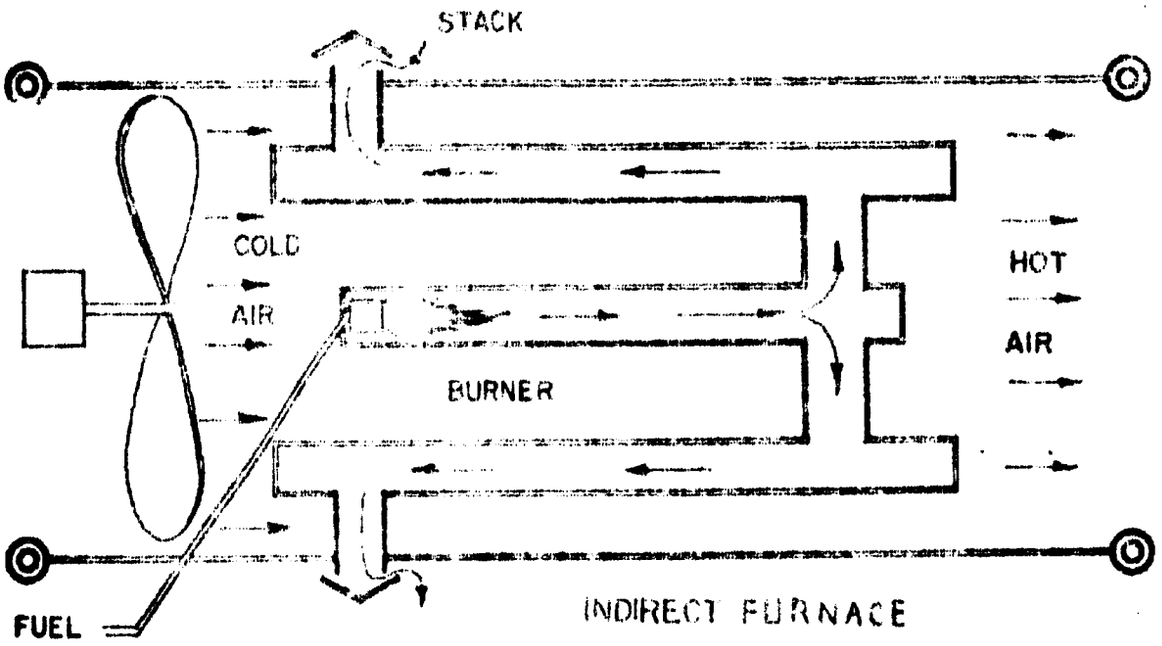


Schematic drawing of a direct fired heater.

(Note: Liquid fuel shown)

and

(b) Indirect heating in which some form of heat exchanger is used.

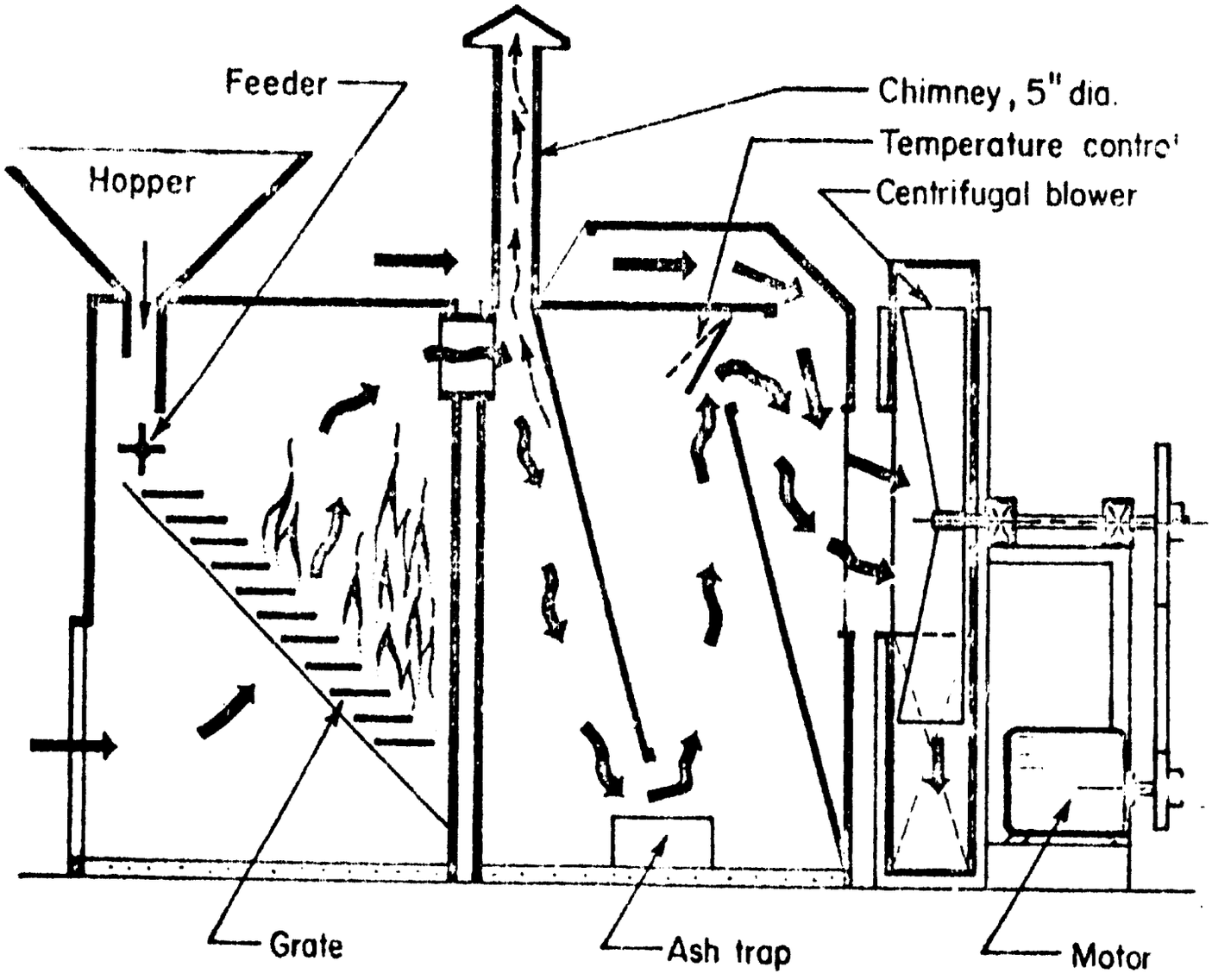


Schematic drawing of an indirect fired heater

(Note: Liquid fuel shown)

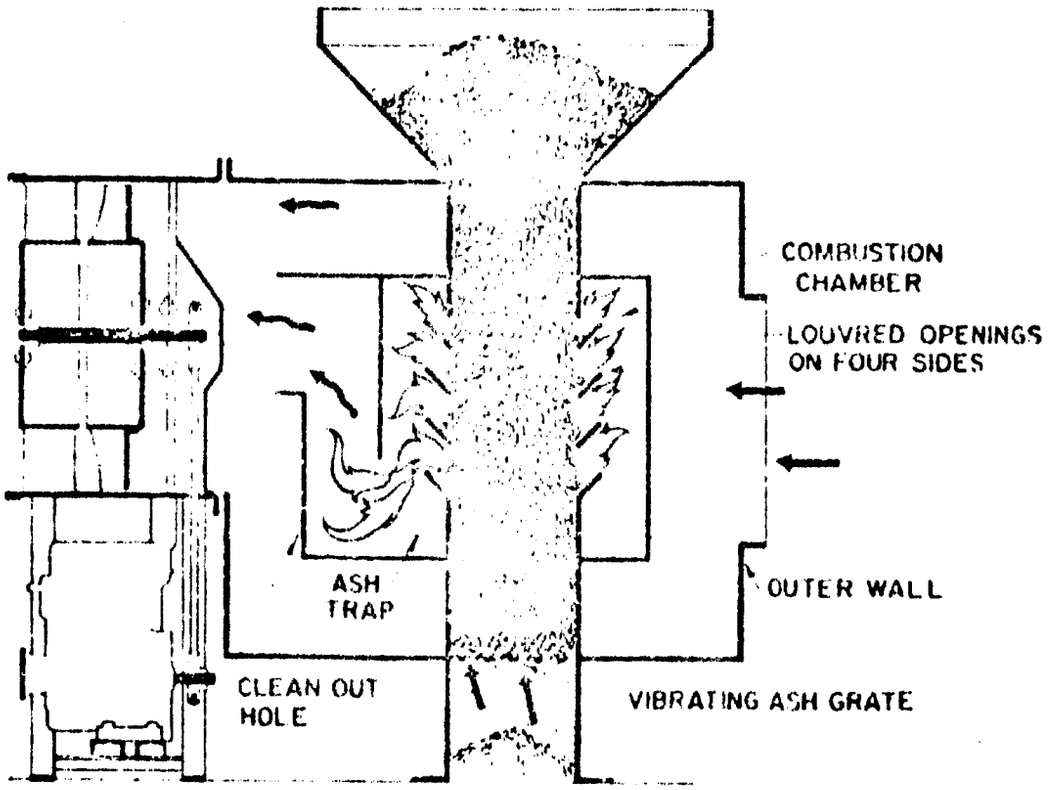
The direct heating is the most efficient and simplest but there is the possibility of contemination by the flue gases. The indirect heating is less efficient and more complicated but there is no possibly of contamination by the flue gases.

Designs of Rice Hull Furnaces



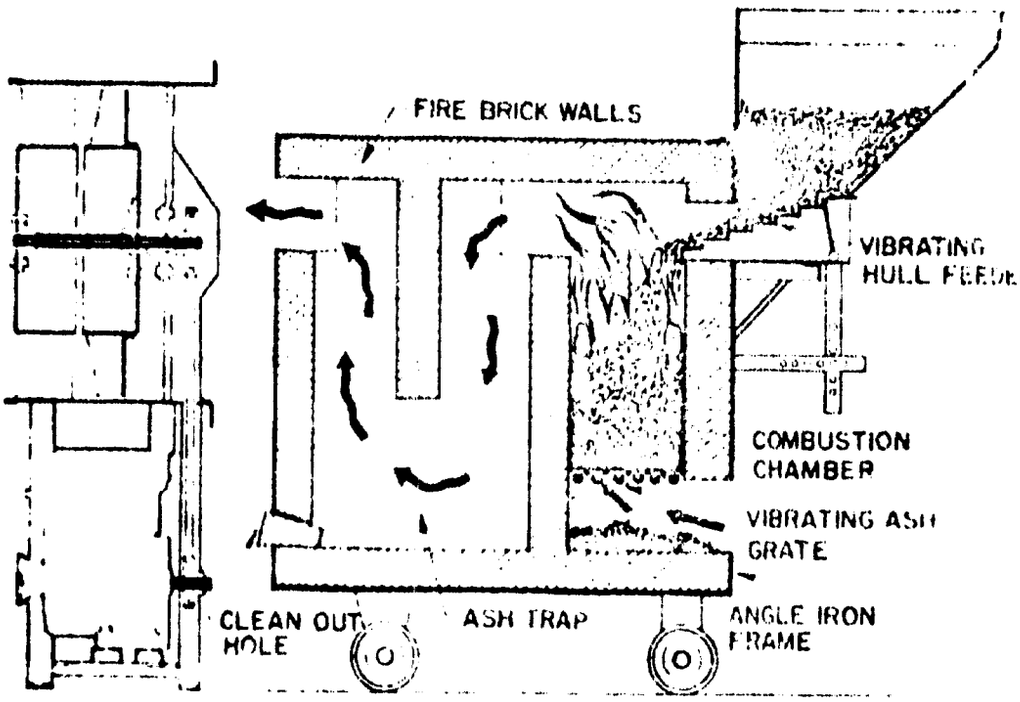
Rice hull furnace

Made by joining two old 44 gallon oil drums together.



RICE HULL FURNACE

Louvered rice hull furnace.

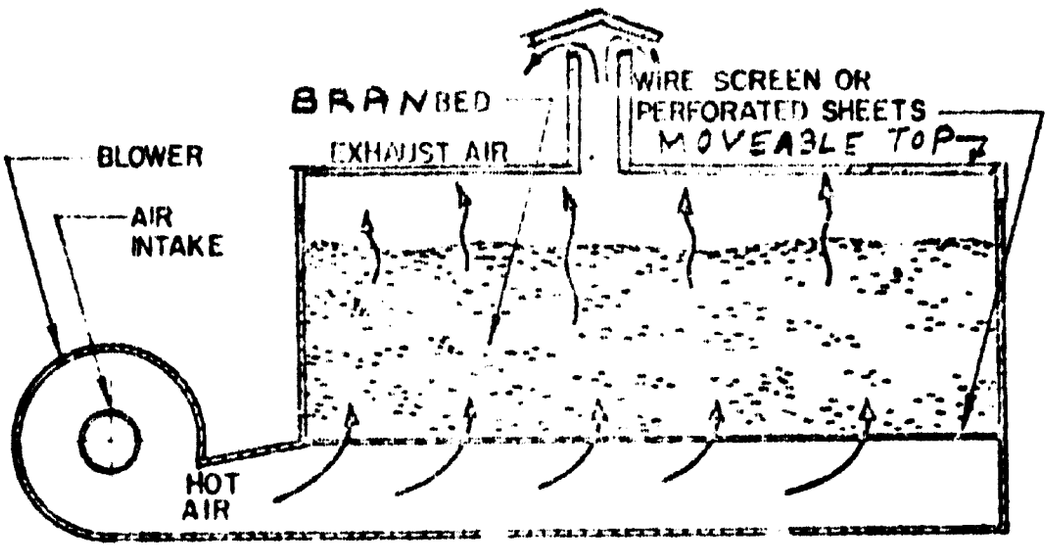


RICE HULL FURNACE

Rice hull furnace made of fire bricks.

Possible designs of equipment for stabilizing rice bran

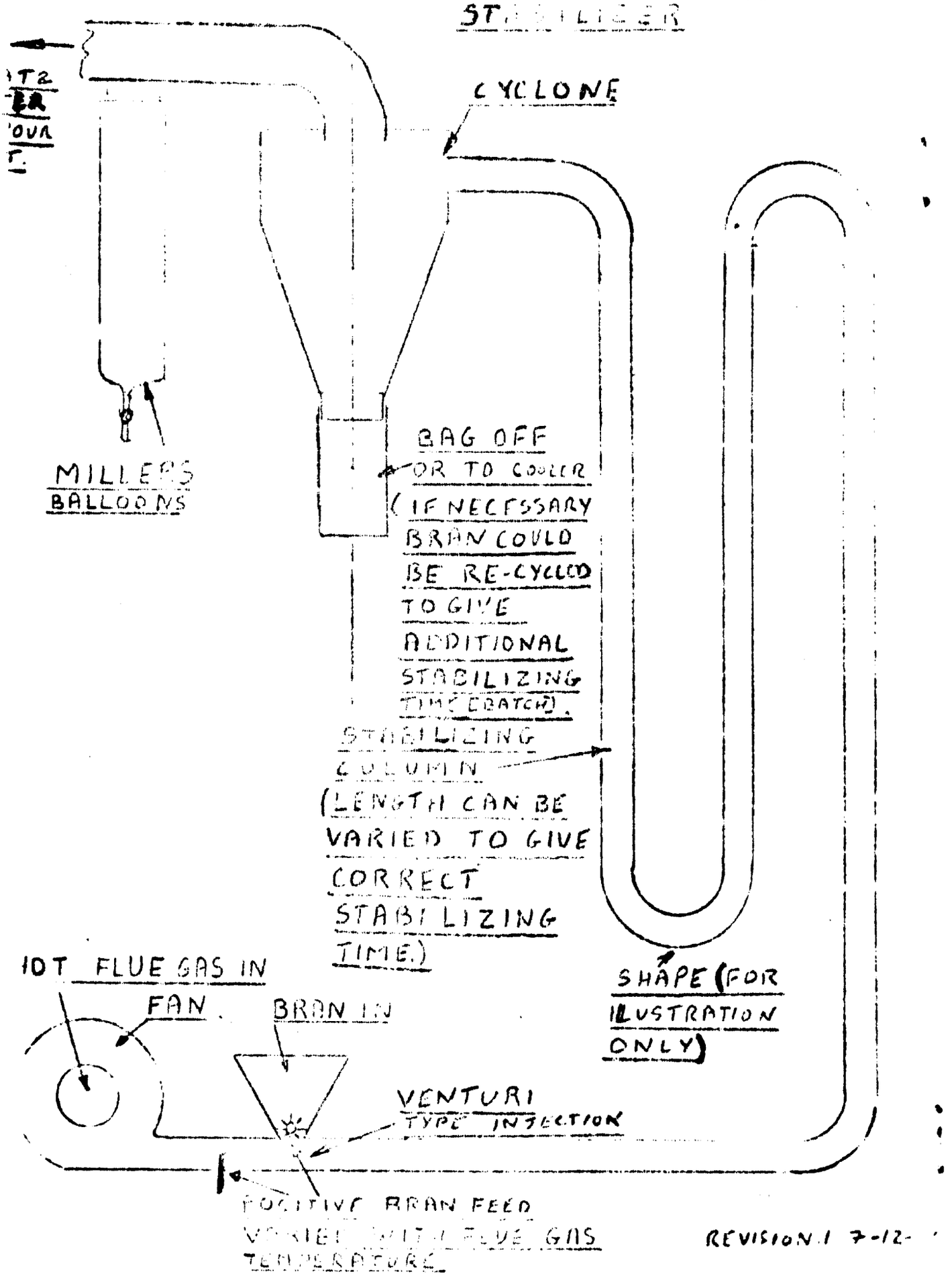
(A) Dry heat process



Flat bed type Stabilizer

Some hand-driven stirrers could be added.

LUMN OF BLOWN HOT FLUE GASES TYPE ST[illegible]LIZER



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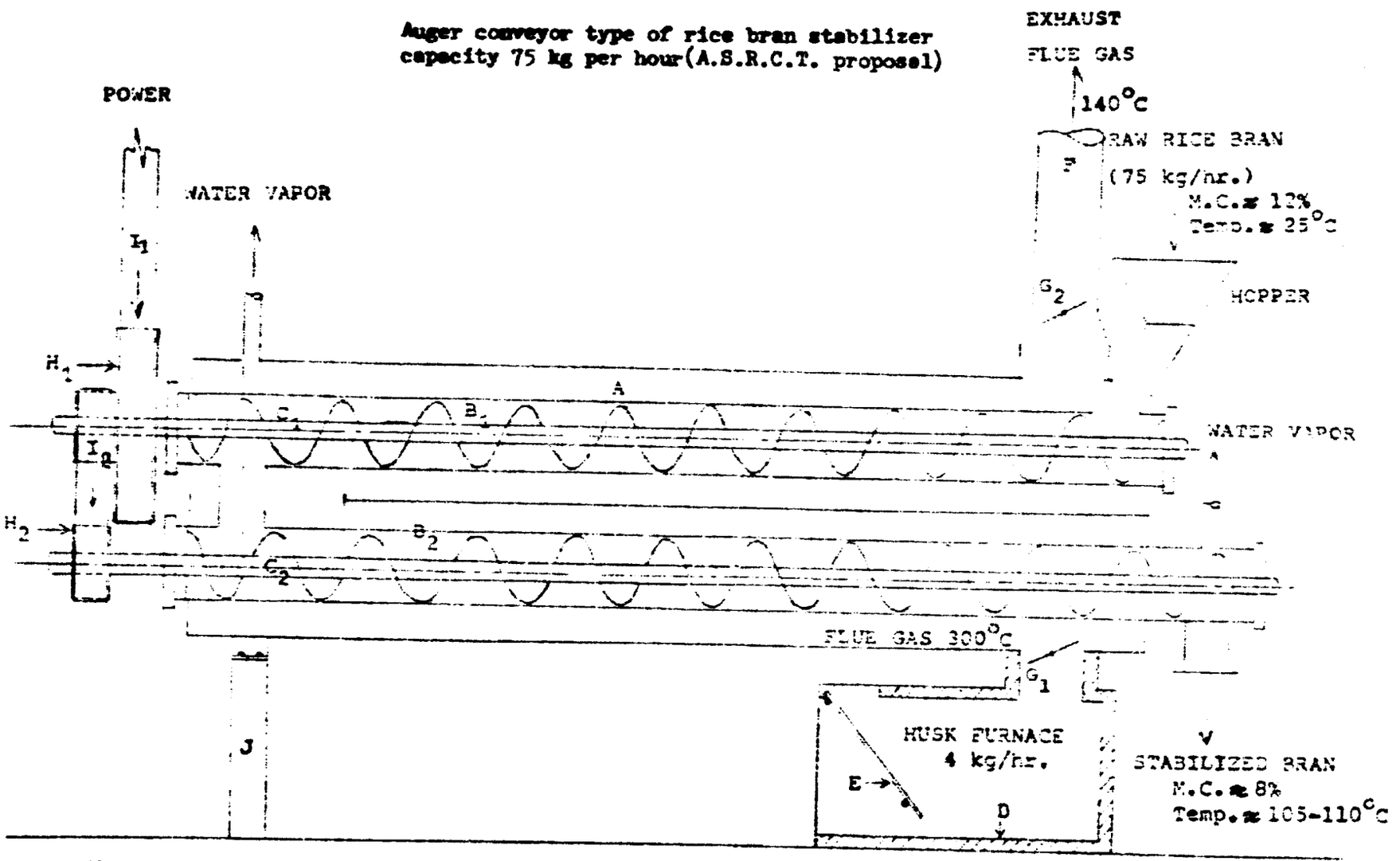
Auger conveyor type of rice bran stabilizer capacity 75 kg per hour(A.S.R.C.T. proposal)



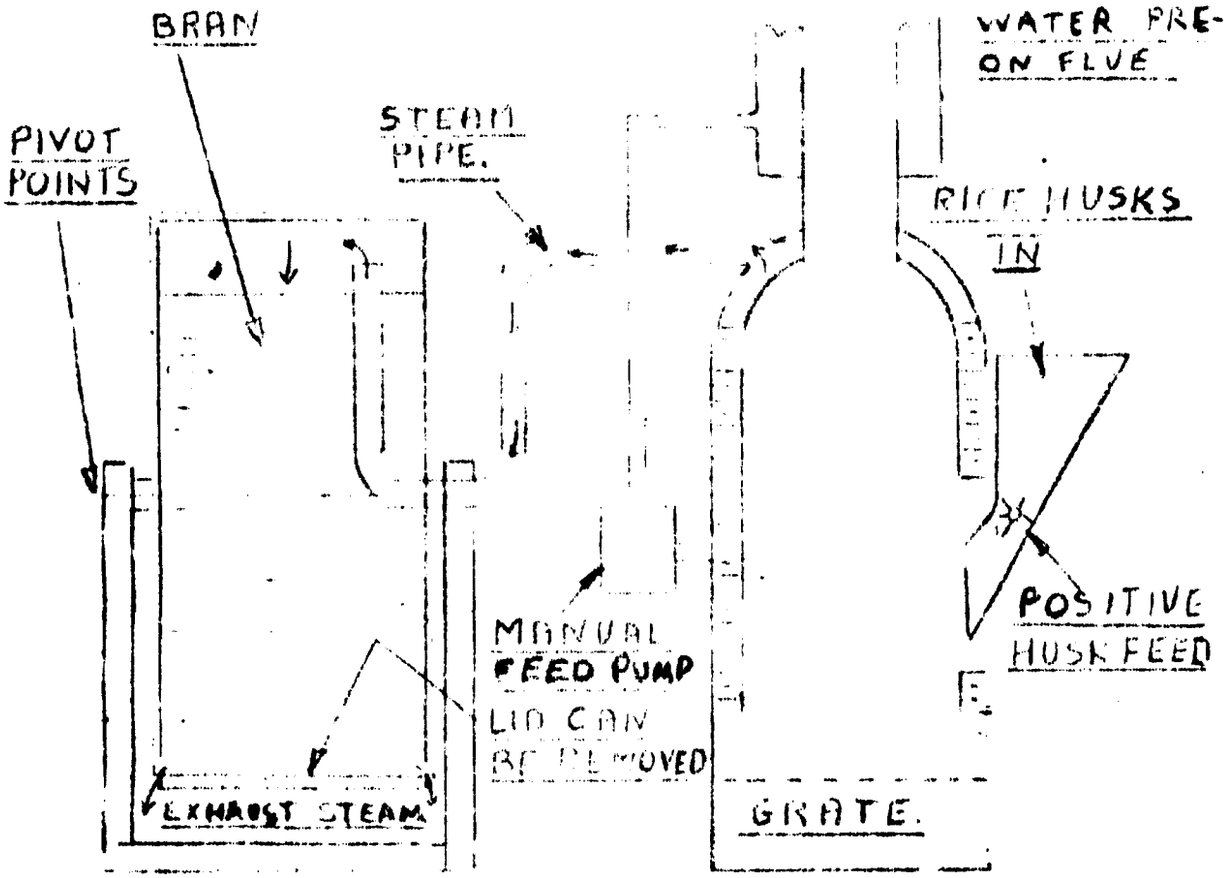
A = flue channel; B_1, B_2 = pipes; C_1, C_2 = shafts with conveyor blades;

D = fire brick; E = grade; F = chimney; G_1, G_2 = Dampers;

H_1, H_2 = driving pulleys; I_1, I_2 = bel s; J = support r

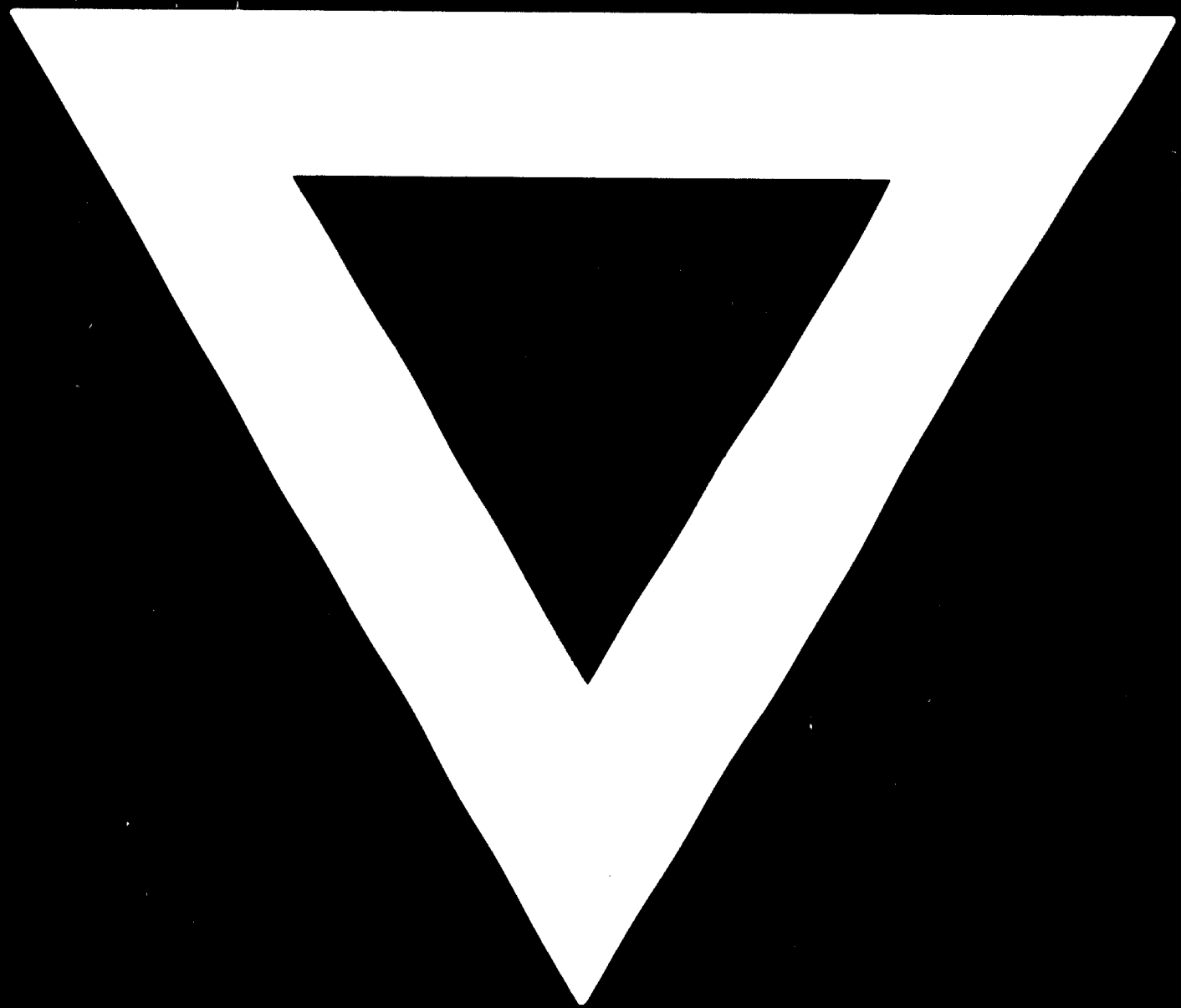
(B) MOIST HEAT TREATMENT.

Stabilising pans and rice husk-fired boiler



PAN CAN BE ROTATED ABOUT THE PIVOT POINTS SO THAT LID IS AT TOP FOR EMPTYING & FILLING

B - 323



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