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LOW COST  
GRAIN STORAGE BIN  
FOR THE  
SMALL FARMER

P.F. Robinson  
and  
R.E. Pierre

INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES - OAS  
NATIONAL LEGUME AND CASSAVA PROGRAMME  
SIMON BOLIVAR FUND  
GUYANA  
MARCH 1979

DOCUMENTO  
MICROFILMADO

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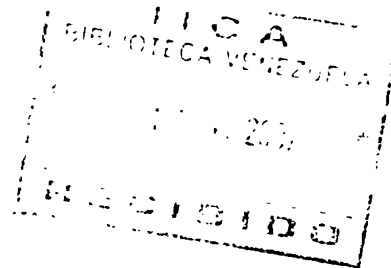
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## QUESTION 1

1. The following table shows the number of people who attended a concert in each of the five years from 2010 to 2014. The number of people who attended the concert in each year is given by the frequency  $f_i$  for the class  $C_i$ .

Year	Frequency $f_i$
2010	120
2011	150
2012	180
2013	210
2014	240

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## INTRODUCTION

Improper storage of grain can result in tremendous post-harvest losses due to damage by insects, rodents and fungi. Protection from fungi usually can be achieved by proper drying of grain prior to storage and rodent-proofing of storage areas can be accomplished without too much difficulty. The control of insects, however, generally is a major problem owing to their small size, which permits them to gain access into storage containers quite easily, and the fact that many storage pests begin grain infestation in the field. This latter factor explains why a farmer after having harvested, threshed, dried and stored blackeye peas in a sealed container, often finds them totally infested by insects some 3-4 weeks later.

Fumigation to effectively kill all insects and insect eggs that are harboured by the grain is an essential pre-requisite for proper storage. But fumigants are poisonous and their unrestricted use by untrained personnel is not advocated. In addition, because of their volatile nature, they require hermetically sealed containers to effectively exert their action.

Within recent times a fumigant which is relatively easy to use has become available. The material known as phostoxin contains Aluminum Phosphide as its active ingredient and is formulated in small tablets or pellets which decompose slowly on absorbing moisture.

With the availability of such a fumigant, it appeared possible to develop a simple storage container which can be hermetically sealed for fumigation thus providing a means whereby the small farmer can effectively store dried grain.

## DESCRIPTION OF STORAGE BIN

The storage bin is essentially a modified 45 gallon metal drum mounted on a wooden frame. Care should be taken in selecting the drum to avoid contamination of the material to be stored. A drum which previously contained fuel, oil or some non-toxic substance that can be easily flushed out is most suitable.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data.

In the second section, the author outlines the various methods used to collect and analyze the data. This includes both primary and secondary data collection techniques. The primary data was gathered through direct observation and interviews with key personnel. Secondary data was obtained from existing reports and databases.

The analysis phase involved a thorough review of the collected information. Statistical tools were used to identify trends and patterns in the data. The results of the analysis are presented in the following section, where the author discusses the implications of the findings for the organization.

Finally, the document concludes with a series of recommendations based on the research findings. These suggestions are aimed at improving the efficiency of the current processes and addressing the identified areas of concern. The author believes that implementing these changes will lead to a more streamlined and effective operation.

The author expresses their appreciation to the staff and management for their cooperation and support throughout the project. They also acknowledge the limitations of the study and suggest areas for future research.

In closing, the author reiterates their commitment to providing high-quality research and analysis to help the organization achieve its goals.



The metal drum was modified in two ways as shown in Figures 1 and 2. In Type A (Fig. 1) the bottom of the drum was cut off and replaced by a metal funnel with a two inch (5 cm) diameter outlet onto which is attached a piece of bicycle rubber tube. The tube is folded at the free end and sealed with a three inch (7.5 cm) bulldog clip. The rubber tube provides a simple means of controlling the outflow of grain, in addition to sealing the bin for fumigation. This type of bin can be mounted in an upright position as the conical base permits the free flow of grain regardless of the amount contained in the bin.

Type B (Fig 2) is cheaper to construct. A hole of approximately two inches (5 cm) in diameter was cut in the bottom of the drum with centre at about three inches (7.5 cm) from the periphery. A plastic wash basin outlet pipe was then fitted into the hole in such a manner so as to form a completely sealed joint (Fig.3). To facilitate fitting the plastic outlet pipe, it was necessary to reduce the diameter of the flange by filing to permit insertion through the filler cap opening. Next, a piece of wire was run from the filler cap opening through the hole made in the bottom of the bin. After removing the locknut and rubber seal from the outlet pipe and using the wire as a guide, the outlet pipe was slid into place (flange uppermost) and the rubber seal and the locknut were replaced. The bicycle tubing was fitted onto the outlet pipe as described earlier. When reasonably full, this type of storage bin operates well in an upright position but when nearly empty it has to be tilted to facilitate removal of the last few pounds of grain.

#### WOODEN STAND

The wooden stand should be robustly constructed in order to carry the fully loaded weight of up to 500 lb (227 kg) and should be of a convenient height to facilitate removal of the grain. A stand of dimensions 18" x 18" x 24" (46 x 46 x 61 cm) has been found to be suitable.

The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in the organization's operations. The text outlines various methods and systems used to collect, store, and analyze data, highlighting the role of technology in streamlining these processes. It also addresses the challenges associated with data management, such as ensuring data integrity and security, and provides recommendations for overcoming these challenges. The document further explores the benefits of a robust data management system, including improved decision-making, enhanced operational efficiency, and better compliance with regulatory requirements. It concludes by stressing the need for continuous monitoring and evaluation of the data management system to ensure it remains effective and up-to-date.

The second part of the document focuses on the implementation and maintenance of the data management system. It details the steps involved in selecting the right system, configuring it to meet the organization's specific needs, and training staff to use it effectively. The text also discusses the importance of regular updates and security audits to protect the system from potential threats. It provides a checklist of key tasks and responsibilities for the data management team, ensuring that all critical aspects are covered. The document ends with a summary of the overall goals and objectives of the data management initiative, reinforcing the commitment to data-driven decision-making and operational excellence.

## TRIALS

A storage trial of blackeye pea was conducted over a period of six months. Sun dried blackeye peas were purchased from a small farmer who had recently harvested his crop. After removal of a sample for laboratory analysis, the peas were placed in two storage bins and fumigated. The bins were kept underneath a house to provide some protection from the weather and yet simulate to some extent the conditions under which a small farmer might store such a bin.

After fumigation, one bin was left untouched for a period of six months but samples were withdrawn weekly from the second bin again in an effort to simulate the conditions of small farmer who may wish to withdraw small amounts periodically, either for sale or for home consumption. Alternate samples were sent to the seed laboratory for analysis but owing to pressure of work, all samples were not analysed. However, the results, which are given in Table 1, are sufficient to indicate that there was no significant deterioration of the blackeye pea after a storage period of five months. Seed discolouration and insect damage remained minimal and there was no increase in the moisture content of the grain. Although tests on cooking quality were not specifically carried out the few persons who were given samples at the end of the period of storage reported quite favourably on the quality of the product.

## DIRECTIONS FOR USE

For best results the following instructions must be adhered to:

- Ensure that a drum free of toxic and contaminating substances is used for making your storage bin.
- Thoroughly clean bin before filling.
- Remove filler cap, ensure that the rubber tube outlet is securely fastened then carefully fill bin almost to capacity with properly dried grain (blackeye peas). Use of a funnel will facilitate this operation.
- Place into storage bin one tablet only of PHOSTOKIN, replace filler cap firmly and leave to fumigate for 72 hours.

1. The first thing I noticed when I stepped out of the plane was the crisp, clean air. It felt like a fresh blanket on my face. The pilot's voice crackled over the intercom, announcing our arrival with a warm smile. I took a deep breath, savoring the moment.

2. As we descended, the clouds below us were a soft, white blanket. The ground below was a patchwork of green fields and brown patches, dotted with small villages. The sun was just setting, painting the sky in shades of orange and pink. It was a beautiful sight, and I couldn't help but smile.

3. The plane touched down smoothly, and the cabin crew immediately began their work. A friendly smile greeted me as they helped me with my luggage. The airport was bustling with activity, but there was a sense of calm. People were waiting for their loved ones, and the air was filled with a mix of emotions.

4. I followed the signs to the baggage claim, where I found my suitcase with a mix of relief and excitement. The journey had been long, but it was worth it. I had finally reached my destination. The excitement was palpable, and I couldn't wait to see the people I had missed so much.

5. As I walked through the terminal, I saw familiar faces everywhere. Friends and family members were waiting for me, their faces lit up with joy. The first hug was the best, and it felt like I had never left. The reunion was a beautiful sight, and I knew that I had come home.

6. The next morning, I woke up in a cozy bed in a small, charming guesthouse. The room was simple but comfortable, with a view of the surrounding hills. The breakfast was delicious, and the host was friendly and helpful. It felt like I had found a new home.

7. The day was filled with exploration. We went to a local market, where I bought some fresh produce and a few souvenirs. The vendors were friendly and the atmosphere was lively. It was a great experience, and I loved every minute of it. The town was beautiful, and I was so glad to be here.

8. As the day progressed, I met some interesting people. They shared their stories and experiences, and I was fascinated. The town had a rich history, and it was so interesting to learn about it. I was lucky to be there, and I was so grateful for the experience.

9. The night was peaceful, and I had a great sleep. The stars were out, and the air was so fresh. It was a wonderful night, and I was so happy to be in this beautiful town. I was so lucky to have found this place, and I was so glad to be here.

10. The next day, I went to a nearby waterfall. The water was crystal clear, and the surrounding forest was lush and green. It was a beautiful sight, and I was so lucky to be there. The waterfall was a great spot for a picnic, and I had a great time. I was so lucky to have found this place, and I was so glad to be here.

11. The day was so wonderful, and I was so lucky to be there. The town was beautiful, and the people were so friendly. I was so lucky to have found this place, and I was so glad to be here. The waterfall was a great spot for a picnic, and I had a great time. I was so lucky to have found this place, and I was so glad to be here.

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- After fumigation remove filler cap and aerate for 48 hours. During aeration the outlet should be covered with gauze or muslin to prevent entry of insects. After aeration replace filler cap. The contents can now be used when required.
- Keep the surrounding area clean at all times. Be specially careful to avoid loose grains on the floor which may serve as a focus of infestation by insects.
- To remove the contents of the bin, hold the rubber tube over a receiving receptacle, remove the bulldog clip and allow the required quantity of grain to flow out.
- To stop the flow of grain, squeeze the rubber tube as high up as possible and allow all the grain to flow from the tube. Then carefully fold the end of the tube and attach bulldog clip.

Note that:

- If new grain is added to the storage bin at any time the above fumigation procedure must be repeated as the chemical has no residual protective value.
- PHOSTOXIN is a harmful, volatile chemical and should be handled with extreme care.
- Using the same concept any other dried grain e.g. corn, pigeon pea, bean, peanut can be similarly stored.

**COSTS**

Type A

Purchase of drum	\$10.00
Welding metal cone	30.00
Bulldog clip	1.00
Cycle tube	-
Wooden stand	5.00
<b>TOTAL</b>	<u>\$46.00</u>

Type B

Purchase of drum	\$10.00
Plastic sink fitting	3.50
Cutting hole	7.00
Bulldog clip	1.00
Cycle tube	-
Wooden stand	5.00
<b>TOTAL</b>	<u>\$26.50</u>

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The text notes that without reliable records, it would be difficult to verify the accuracy of financial statements and to identify any irregularities.

2. The second part of the document outlines the various methods used to collect and analyze data. It describes the process of gathering information from different sources, such as interviews, surveys, and document reviews. The text also discusses the importance of ensuring the reliability and validity of the data collected, and the need to use appropriate statistical techniques to analyze the results.

3. The third part of the document focuses on the interpretation of the data and the drawing of conclusions. It explains how the collected information is used to identify patterns, trends, and anomalies. The text stresses the importance of being objective and unbiased in the interpretation of the data, and of providing a clear and concise summary of the findings.

4. The fourth part of the document discusses the implications of the research and the recommendations for future work. It highlights the need for continued research in this area, and the importance of sharing the results of the study with other researchers and practitioners. The text also provides suggestions for how the findings can be applied in practice to improve the efficiency and effectiveness of the financial system.

**TABLE 1** Data from sample analyses of blackeye pea stored over a period of six months.

Sample Characteristics ----- % ----- (a)*	Date of Sampling (1978)							
	Apr 22	May 4	May 24	June 15	June 28	Aug 2	Aug 21	Sept 14
Pure Seed	86.6	84.3	86.8	86.0	80.4	82.3	84.2	91.3
Badly Discoloured	2.5	3.4	3.2	2.5	4.5	1.5	2.5	1.5
Splits	0.8	0.2	1.2	1.5	1.1	1.6	2.4	0.3
Damage (Seed Coat)	5.8	7.2	6.2	8.0	12.0	10.7	9.9	6.0
Foreign Matter	0.0	0.0	1.2	1.0	1.0	0.4	0.2	0.0
Moisture Content	NA	19.6	17.9	NA	NA	14.2	17.5	14.2
Small Seeds	3.5	4.9	1.4	1.0	1.0	3.5	0.8	0.9
Insect Damage	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

\* (a) Many of the characteristics examined are important for seeds that are to be used as planting material. The most important characteristics which would reflect deterioration of consumable material are insect damage, moisture content and seed discoloration.

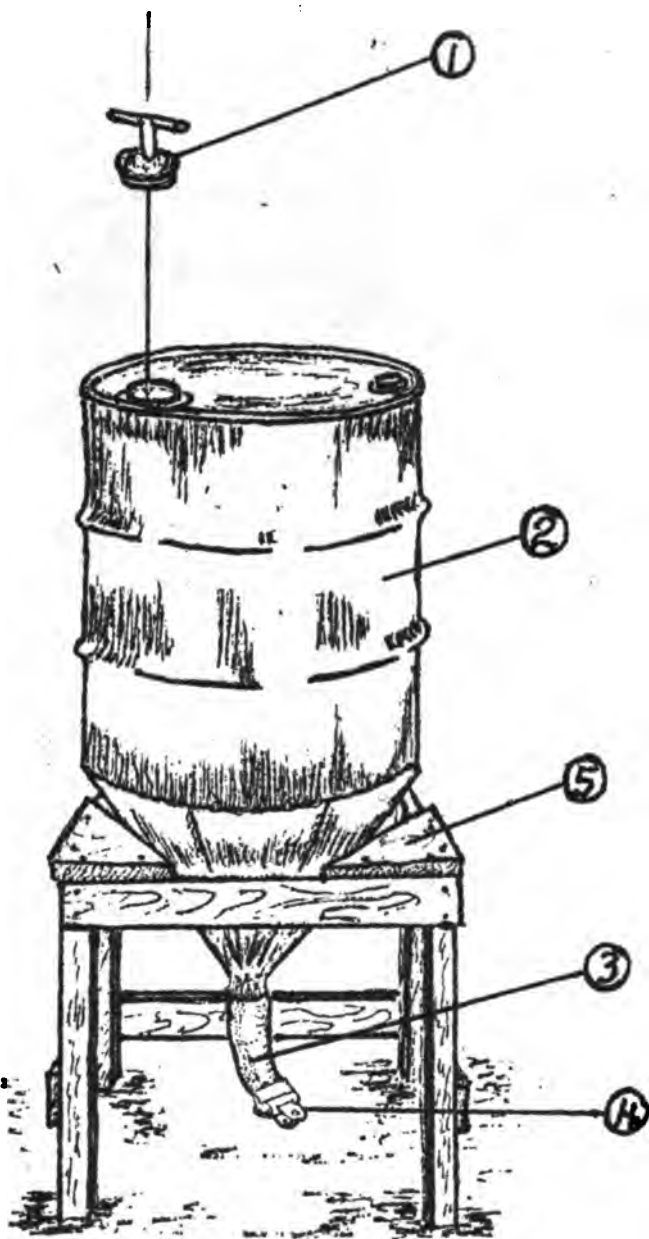
Project No.	Name of Project	Location	Value	Year	Remarks
1	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
2	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
3	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
4	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
5	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
6	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
7	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
8	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
9	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
10	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]

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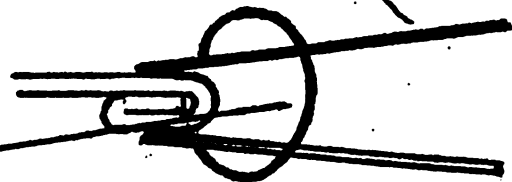


FIG. 1

- ① FILLER CAP
- ② BIN
- ③ RUBBER CYCLE TUBE
- ④ BULL DOG CLIP
- ⑤ WOODEN STAND



BULL DOG CLIP



RUBBER TUBE TO BE FOLDED THUS

LOW COST STORAGE BIN (TYPE "A")

CAPACITY - 480 lbs

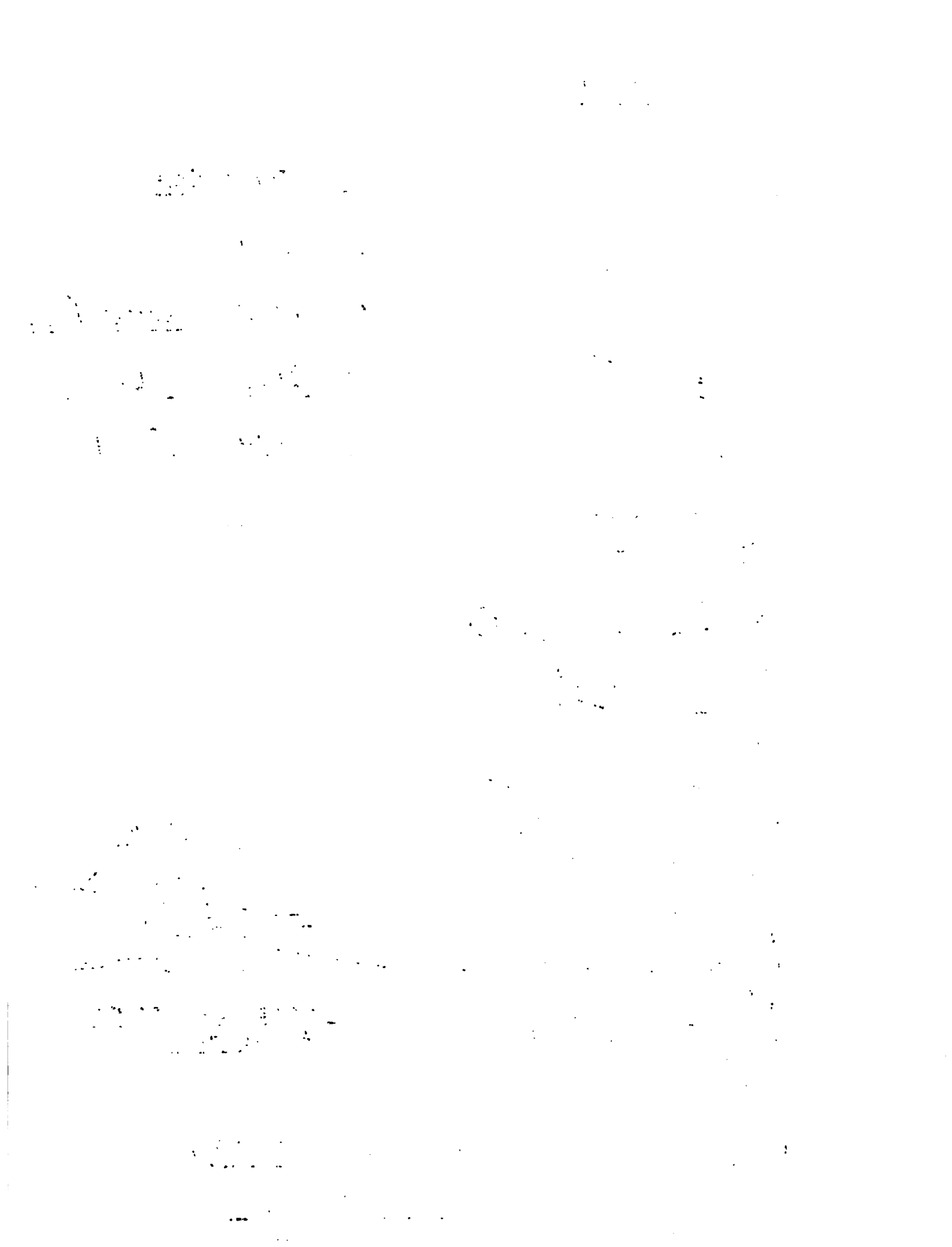
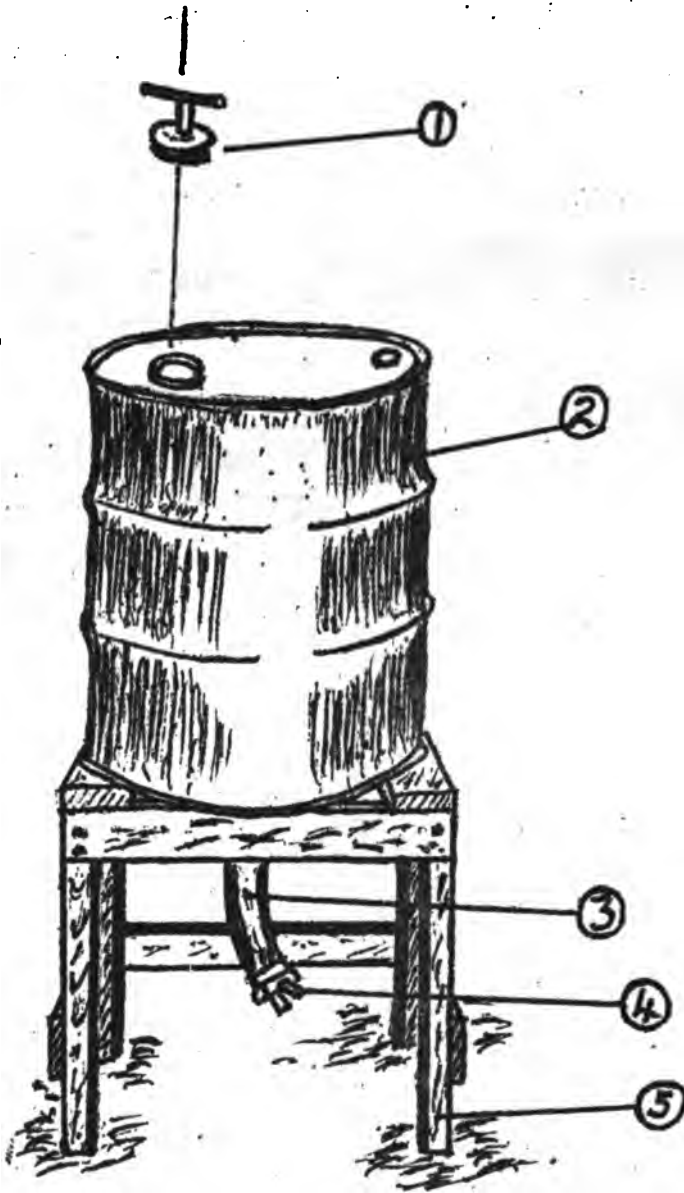
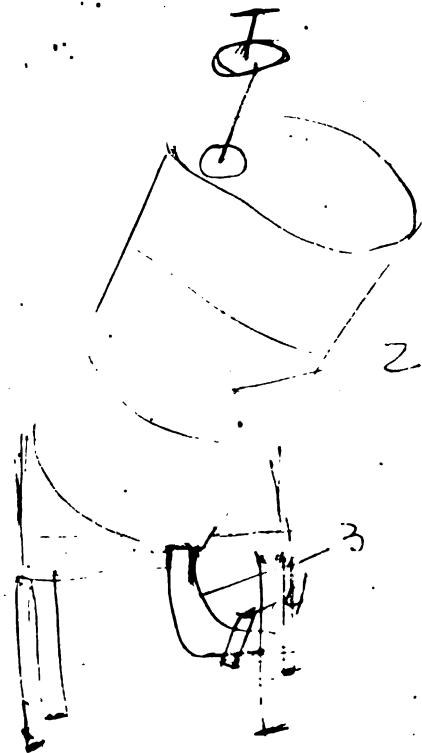


FIG 2



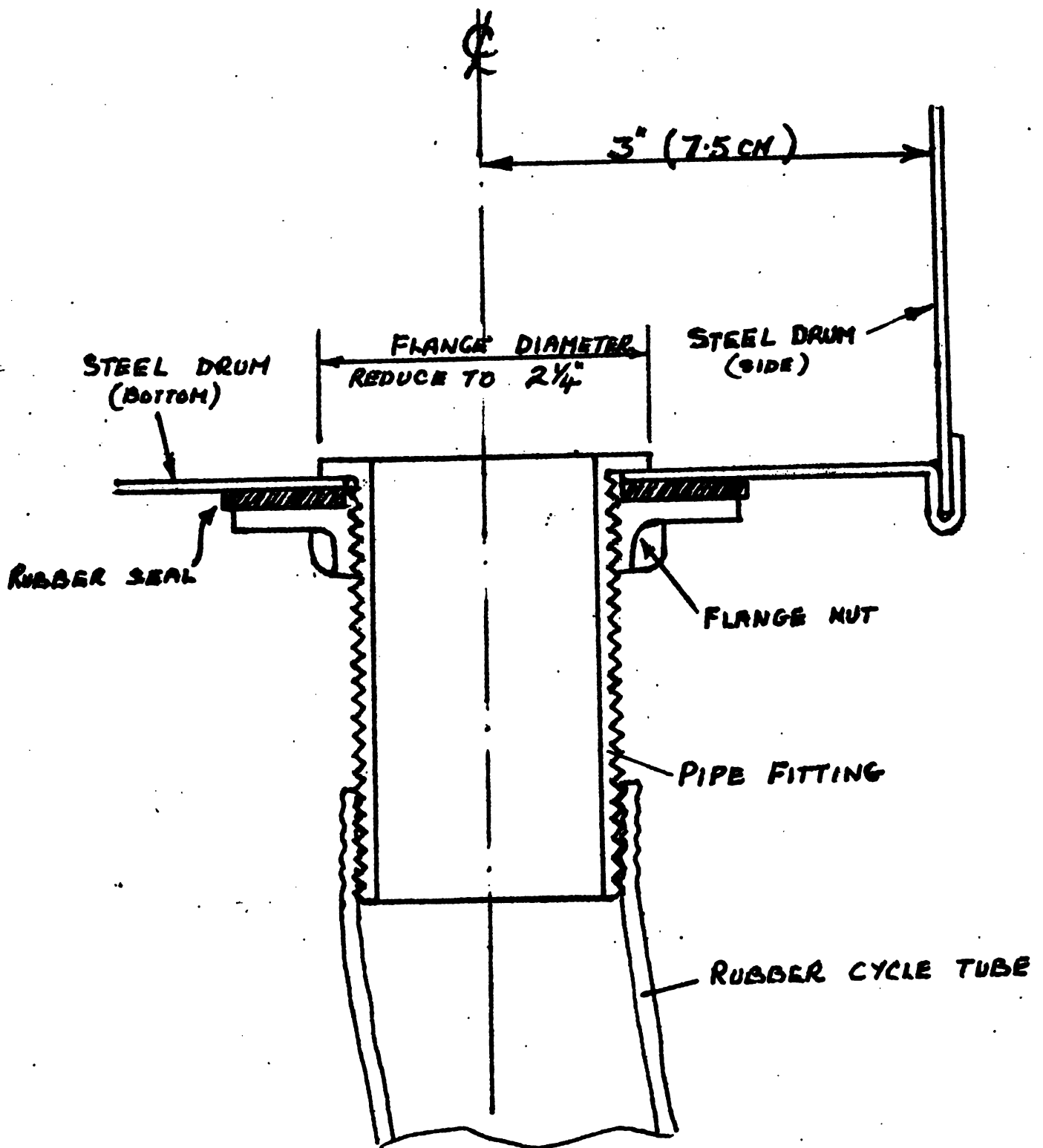
- ① FILLER CAP
- ② BIN
- ③ CYCLE TUBE
- ④ BULL DOG CLIP
- ⑤ WOODEN STAND



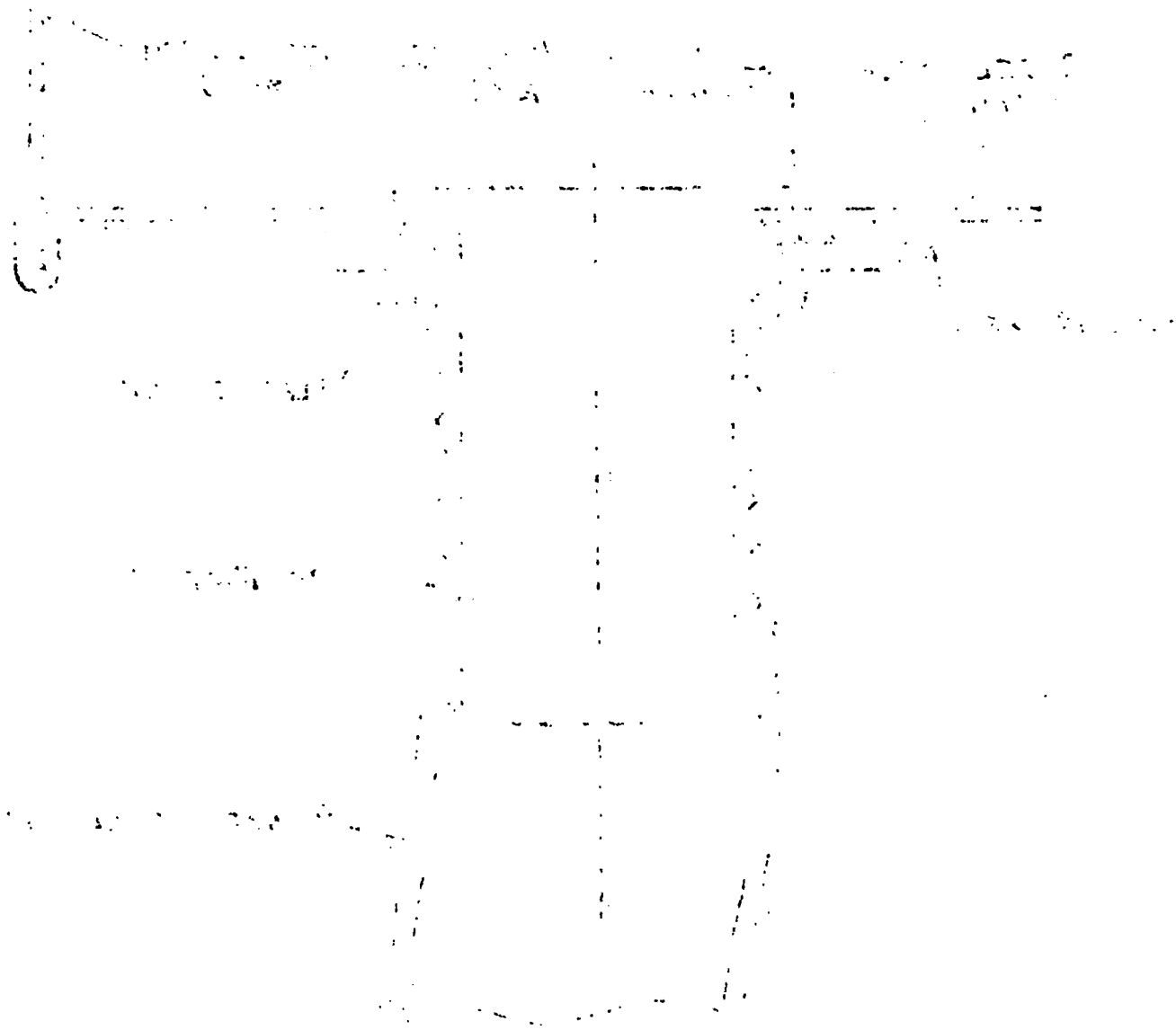
LOW COST STORAGE BIN (TYPE B)

CAPACITY 400 lbs

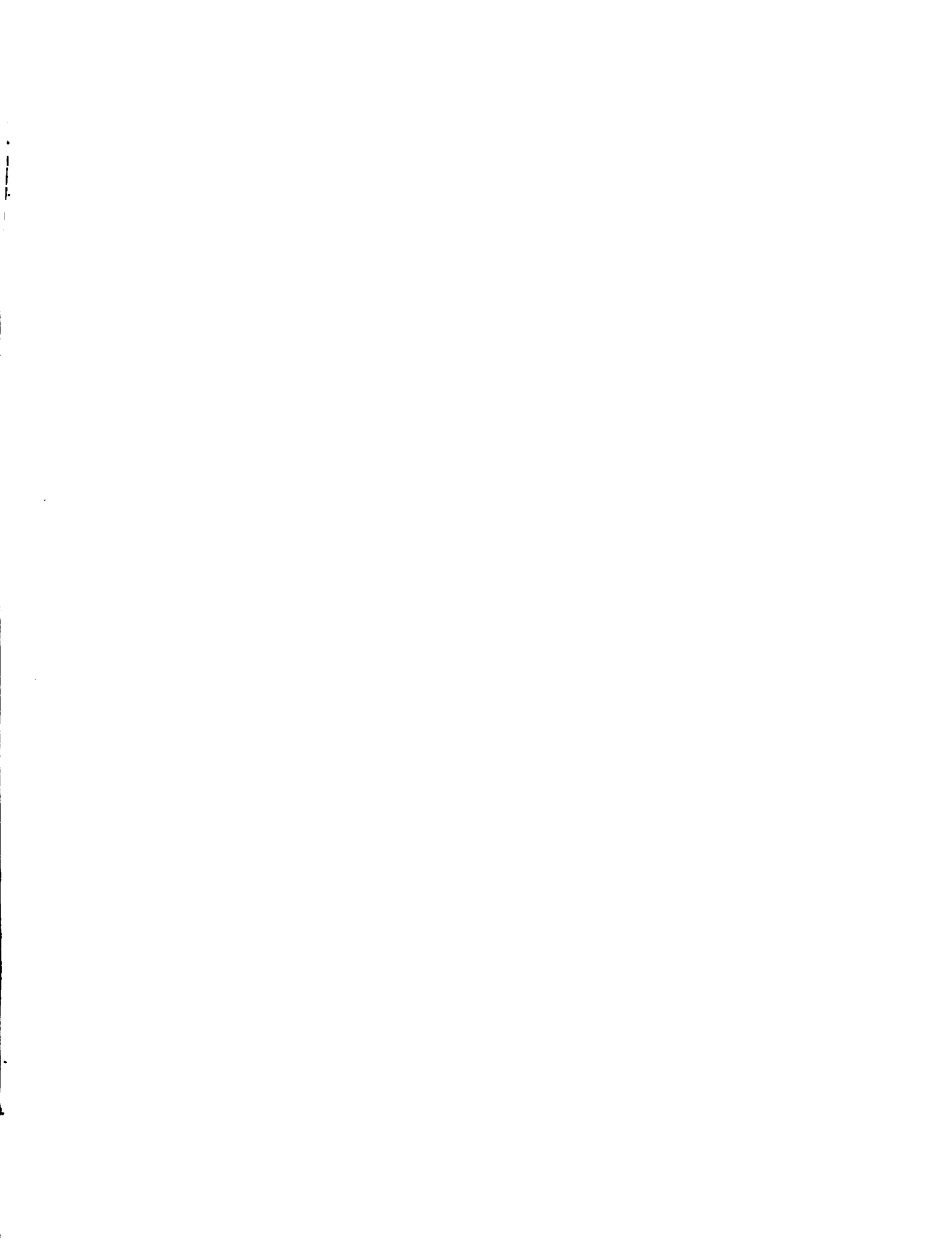
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**FIG. 3 SECTIONAL VIEW - SHOWING PIPE CONNECTION TO STEEL DRUM**



1. The diagram shows a vertical shaft with several horizontal arms or vanes extending from it. The shaft is supported by a circular base with several vertical supports or legs. The top part of the diagram shows a curved structure, possibly a housing or a valve mechanism, with various internal lines and connections. The diagram is drawn with dashed lines, suggesting it is a conceptual or preliminary sketch.









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