

# **Indian Institute of Technology Kanpur**

## **TA201A Manufacturing Processes I**

### **Project Title**

### **Winnowing Machine**

### **Group – M1G4 Project Report 2021**

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**Lab Incharge : Mr Indra Pal Singh**

**Lab Staff members : Mr. AK Verma and Mr. Gaurav Mishra**

**Tutor : Dr. Shashank Shekhar**

**Teaching Assistants: Mr Akash Yadav and Ms Jhilik Sen**



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# Executive Summary

The goal of our project is to design a winnowing machine using different manufacturing processes for each of the component. Our group designed a winnowing machine containing following major parts - grain and air inlet, fan blades, gearbox, stand, base frame, wire mesh.

A winnowing machine is a real example of how science can make things easier. It is of two types - manual and external power operated and comes in different designs.

In this project, we have made a model of a simple winnowing machine. Isometric Drawings of different parts and whole assemble were made with AutoCAD and then orthographic views were made from it. The manufacturing processes and materials involved for different parts were selected properly. The overall cost of the project was determined on the basis of materials used and fabrication processes opted.

# Acknowledgement

The success and final outcome of our design project required a lot of guidance and assistance from many people, and we are extremely privileged to have got this all for completion of our project.

We would like to express our sincere gratitude to our tutor **Dr. Shashank Shekhar** and our lab-in-charge **Mr. Indra Pal Singh** for their support and instruction in this project. Their support and direction were instrumental throughout the execution of the project.

We thank **Dr. Shashank Shekhar**, Course Instructor TA201A for providing us with this opportunity to explore our creativity and create something of our own through the lab manufacturing processes.

We also thank our TAs **Mr Akash Yadav** and **Ms Jhilik Sen** for their valuable time and efforts.

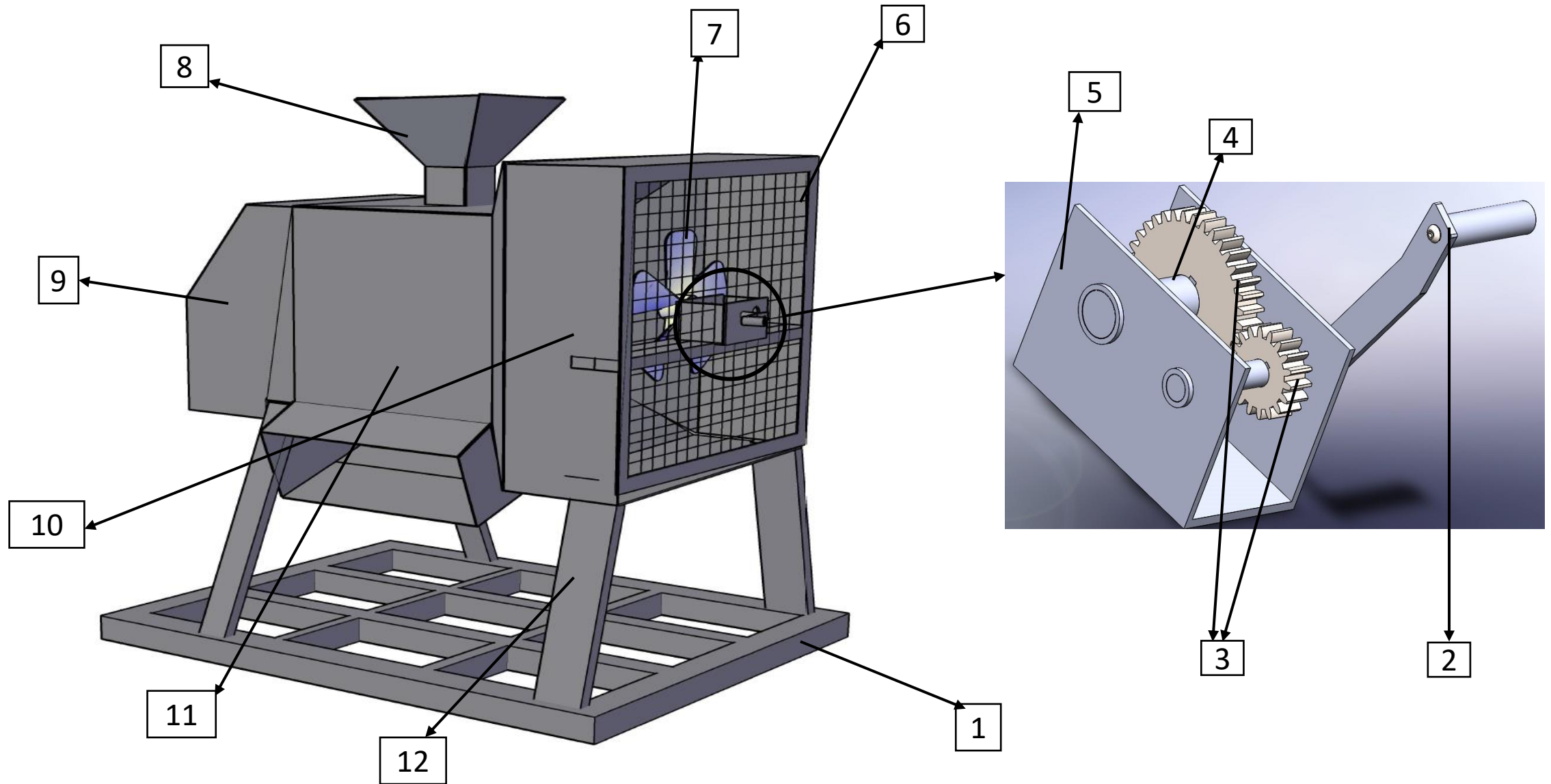
## **Introduction**

A winnowing machine is a machine used for separating the chaff from grain by an artificial current of air. The use of a winnowing machine has made thrashing easy, less tedious. It has increased the efficiency of the farmers. Apart from that, the corn separated from this process will lie tightly, so as to admit a free current of air: hence, sweating and shrinking of the grain will be prevented. There are two types of winnowing machines, one operated manually and the other by use of a power source like a motor. In this project, we have designed a manually operated winnowing machine.

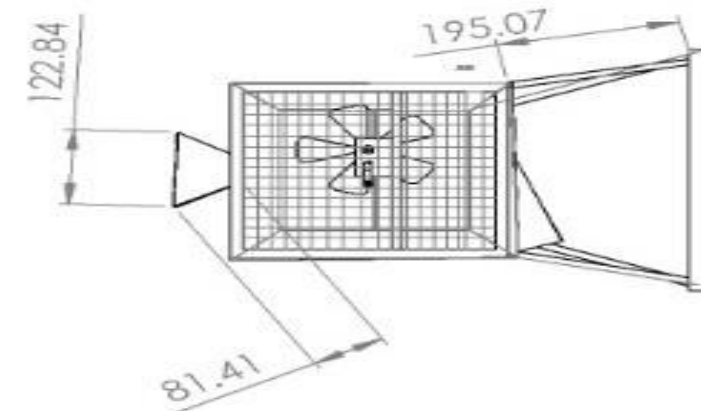
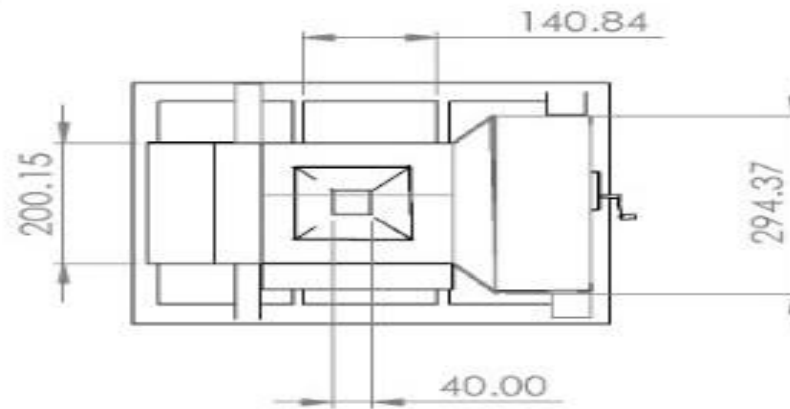
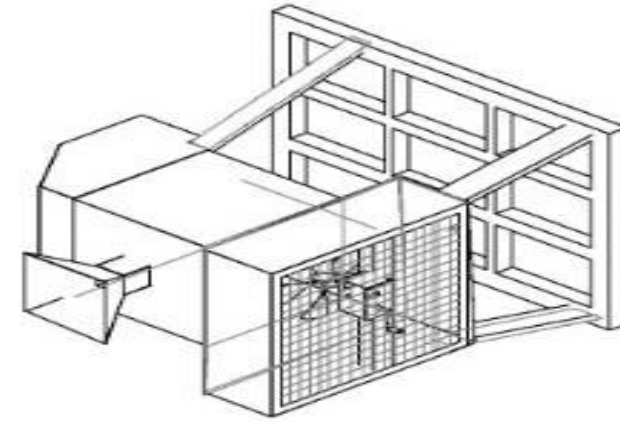
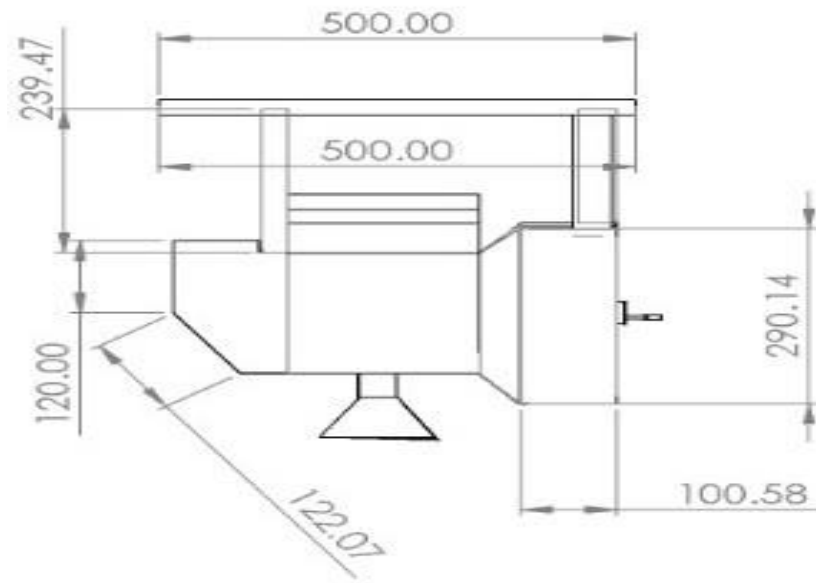
## Working

- ❖ This machine winnows the paddy already threshed by a paddy thresher or other means. It is based on a simple gear-based mechanism.
- ❖ It has a feeding hopper at the top to receive the threshed paddy with other impurities. It discharges the threshed paddy over a scalper and removes bigger size impurities.
- ❖ The fan provided in the back part sends a stream of air, through the handle given outside it, against the grain falling through the scalper, which separates the straw, chaff and other impurities.
- ❖ The dust, chaff and straw are collected separately and cleaned paddy is taken out through another outlet near the bottom of the unit.

# Engineering Drawings

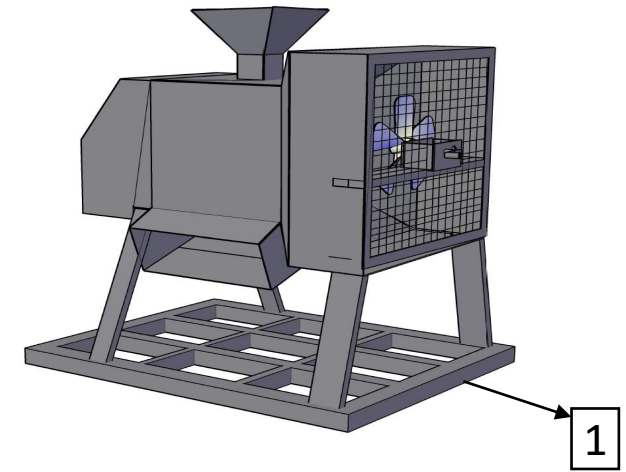
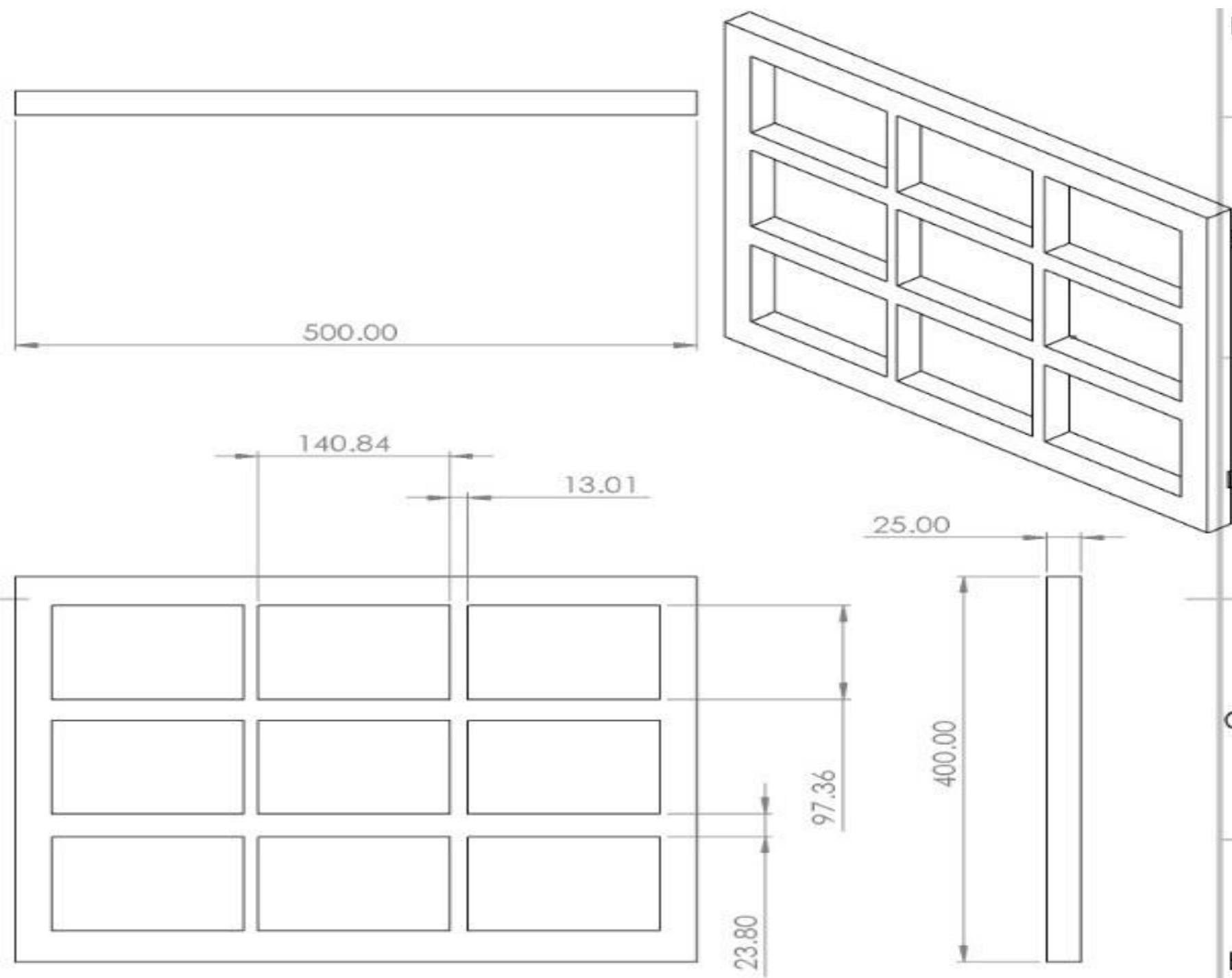


Final Assembly

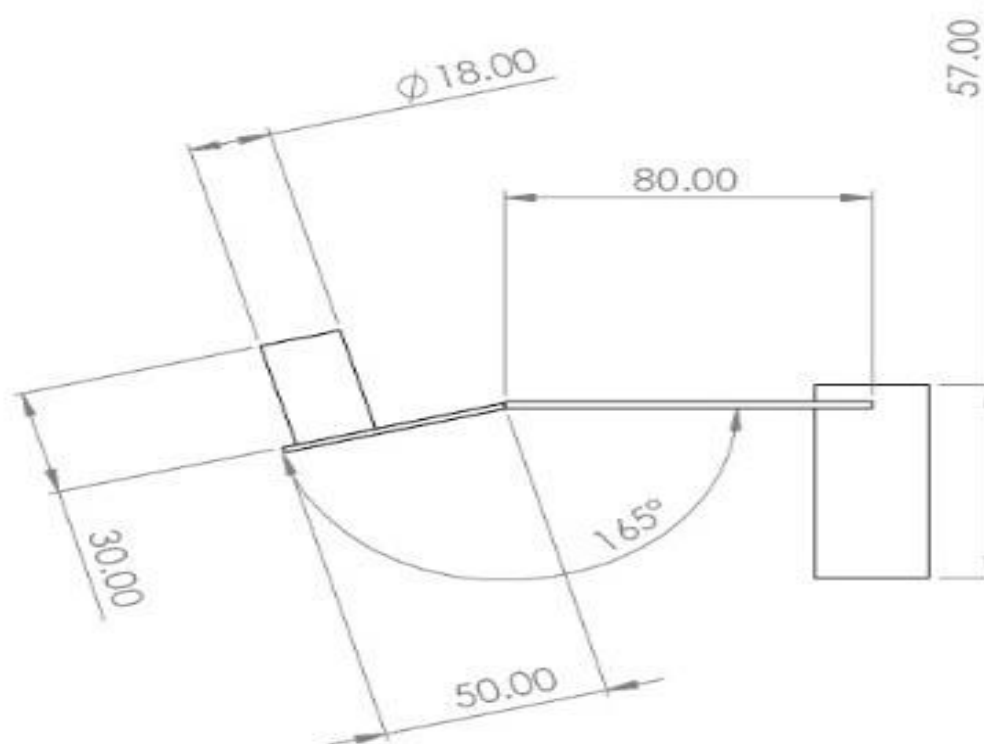
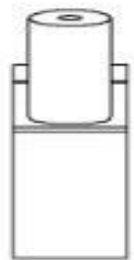
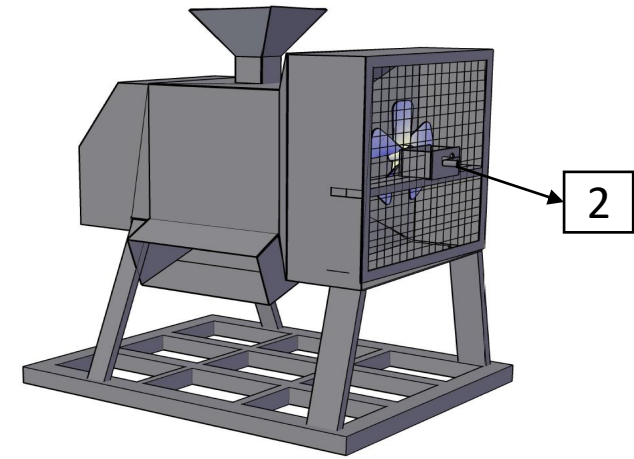
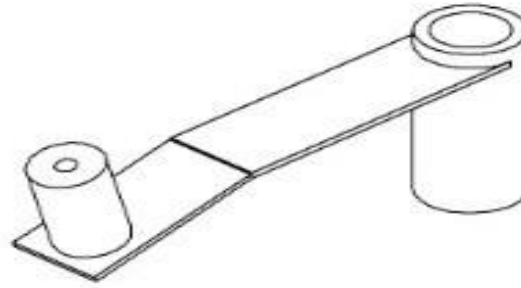
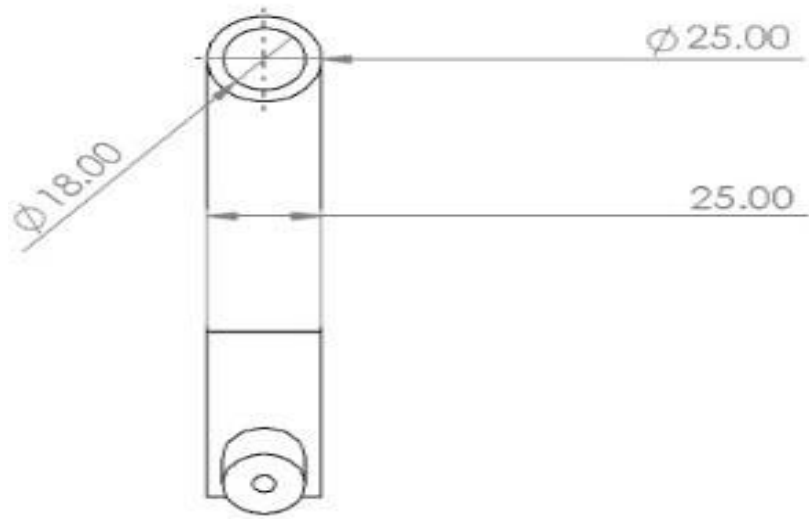


Main Assembly(Dimensions in mm)

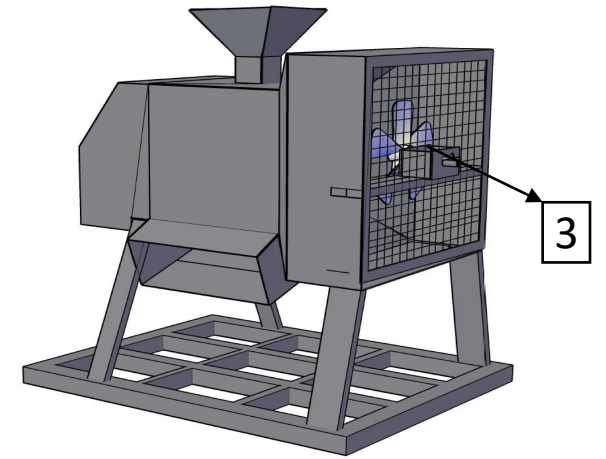
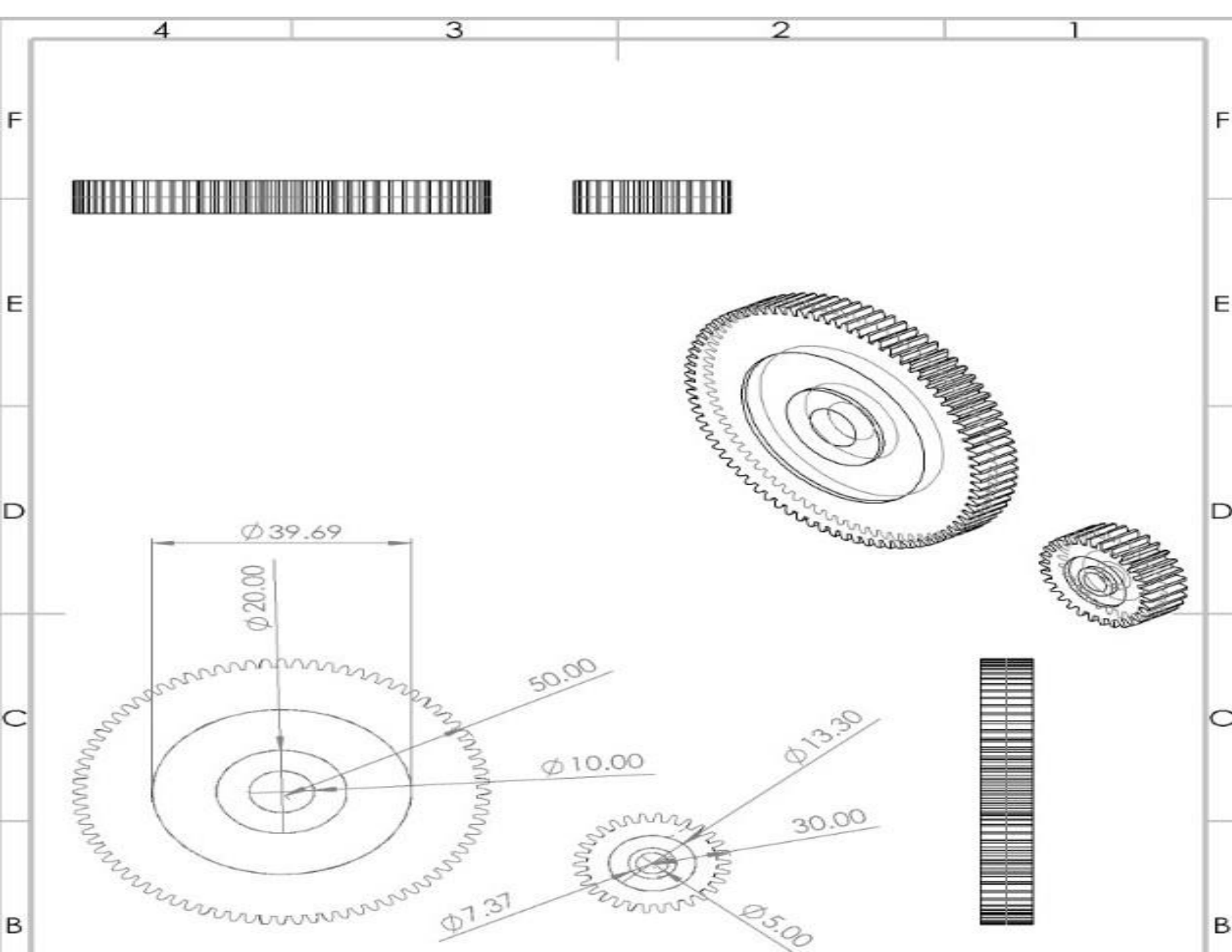




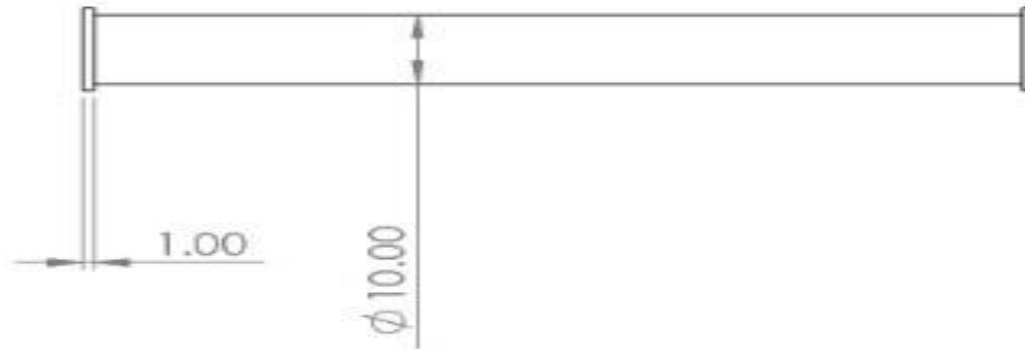
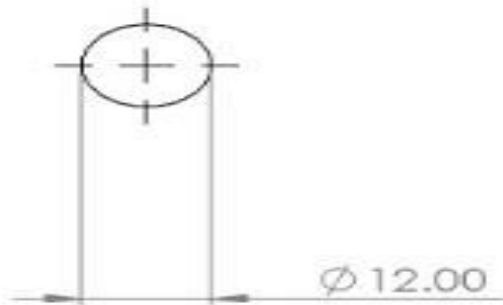
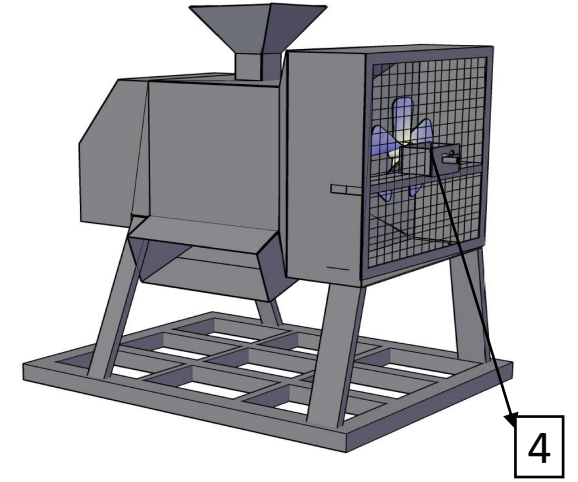
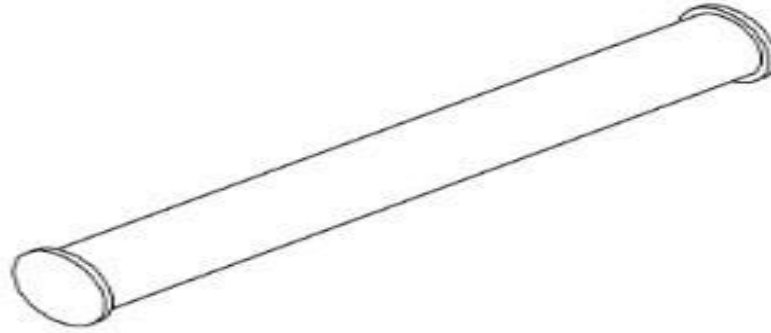
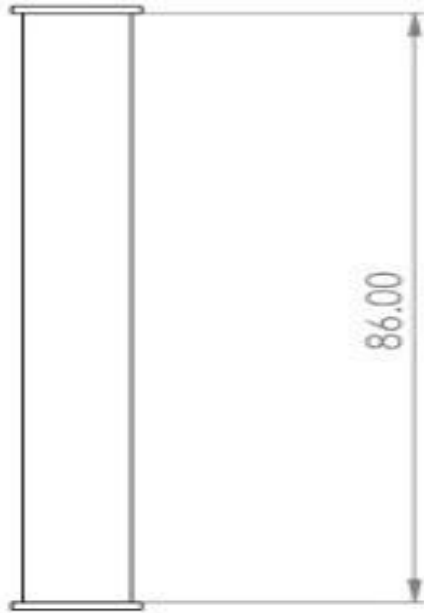
- Part no: 1
- Part Name: Base Frame
- Material : Mild Steel  
Square Rod
- Quantity: 1
- Dimensions in mm



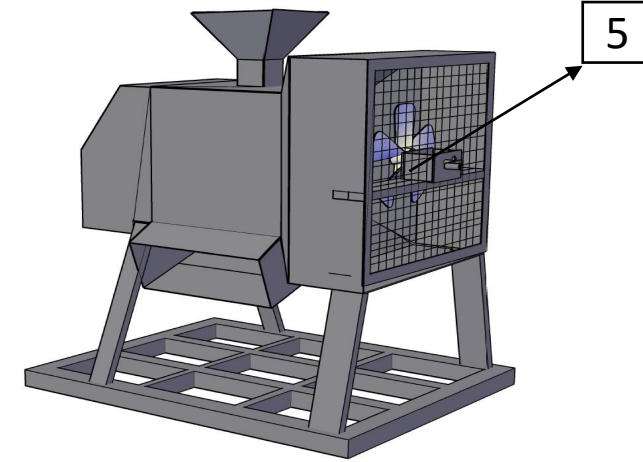
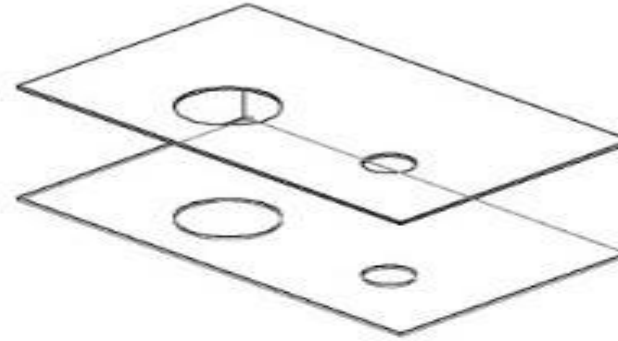
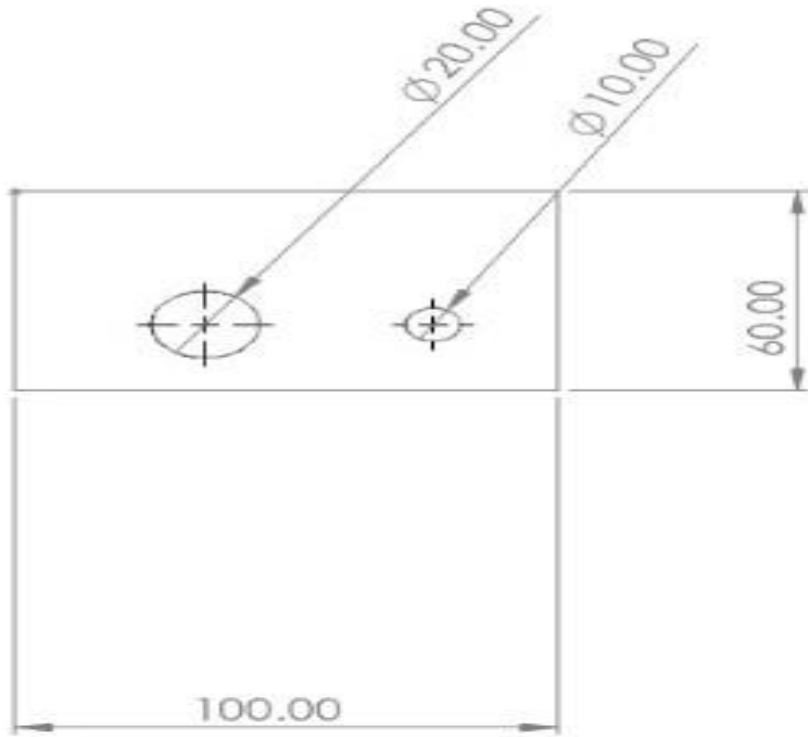
- Part no: 2
- Part Name: Handle
- Material : Mild Steel  
Flat and Round Pipe
- Quantity: 1
- Dimensions in mm



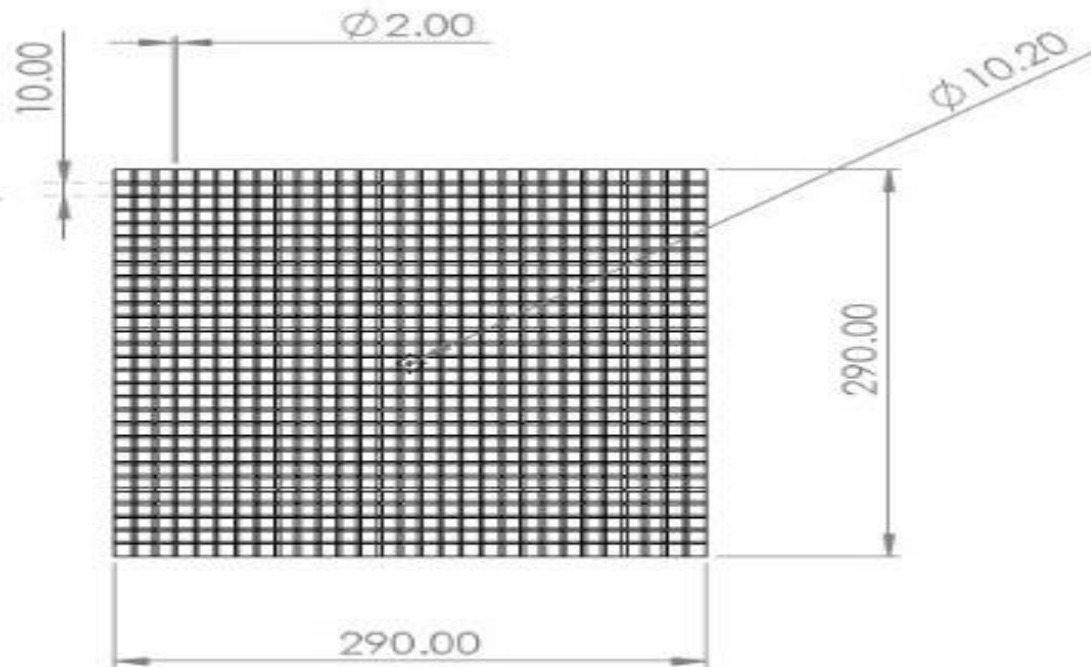
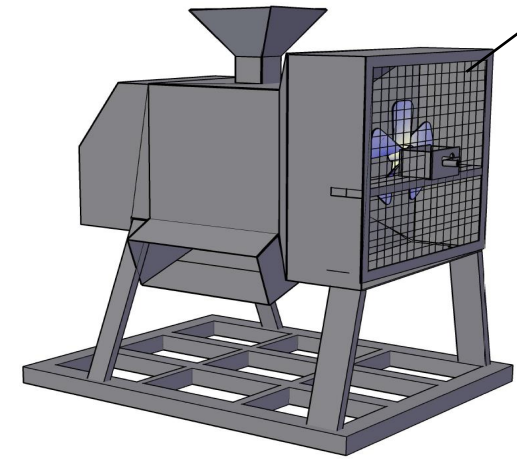
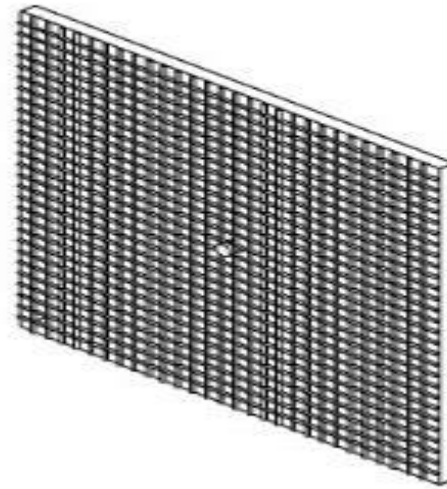
- Part no: 3
- Part Name: Gears
- Material : Cast Iron
- Quantity: 2
- Dimensions in mm



- Part no: 4
- Part Name: Axle
- Material : Cast Iron
- Quantity: 2
- Dimensions in mm

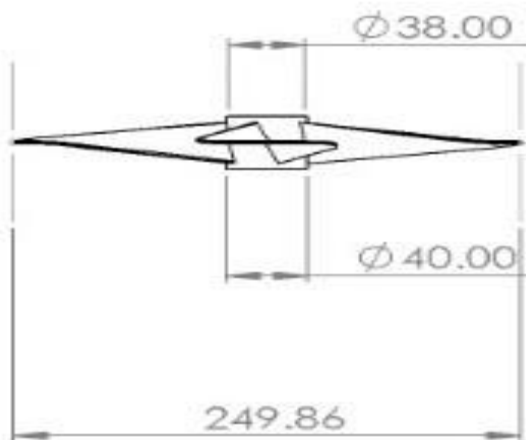
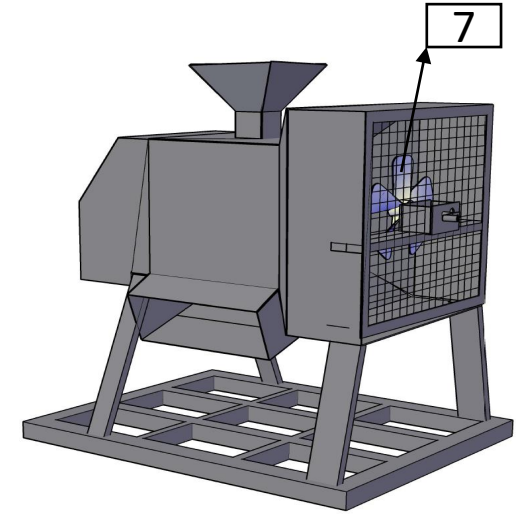
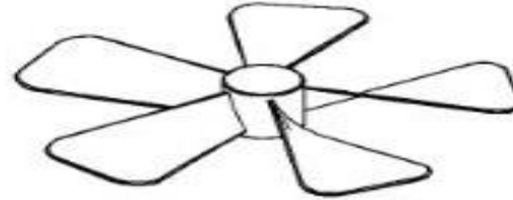
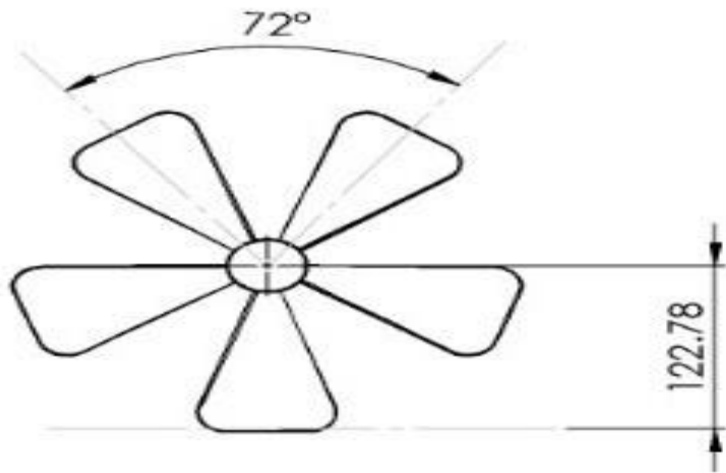


- Part no: 5
- Part Name: Gear Box
- Material : Steel Sheet
- Quantity: 1
- Dimensions in mm

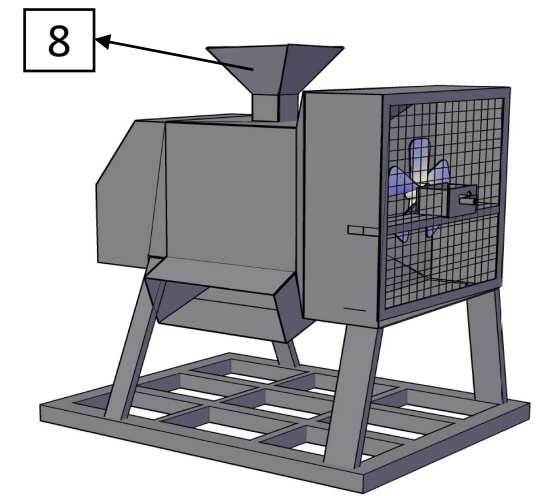
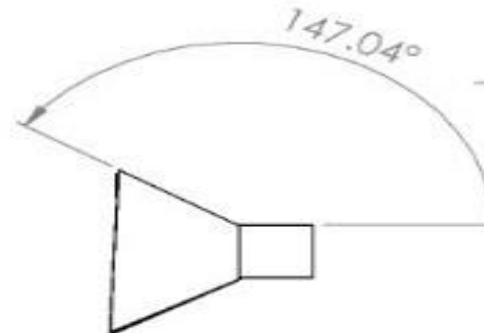
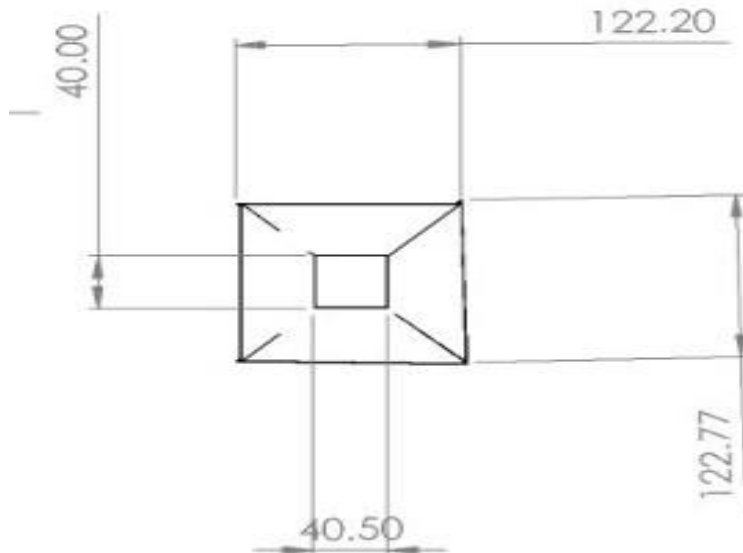
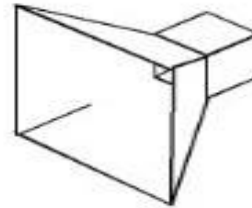
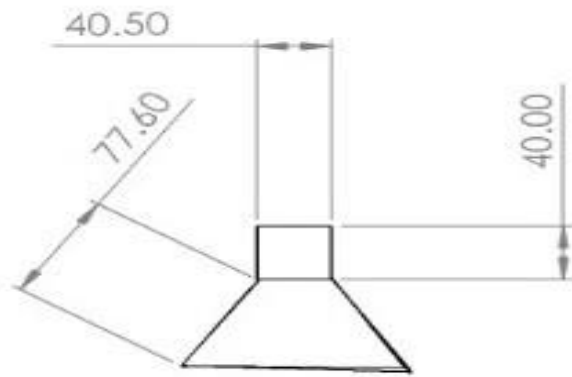


- Part no: 6
- Part Name: Wire Mesh
- Material : Galvanized Wire, Steel Angle, Steel Sheet
- Quantity: 1
- Dimensions in mm



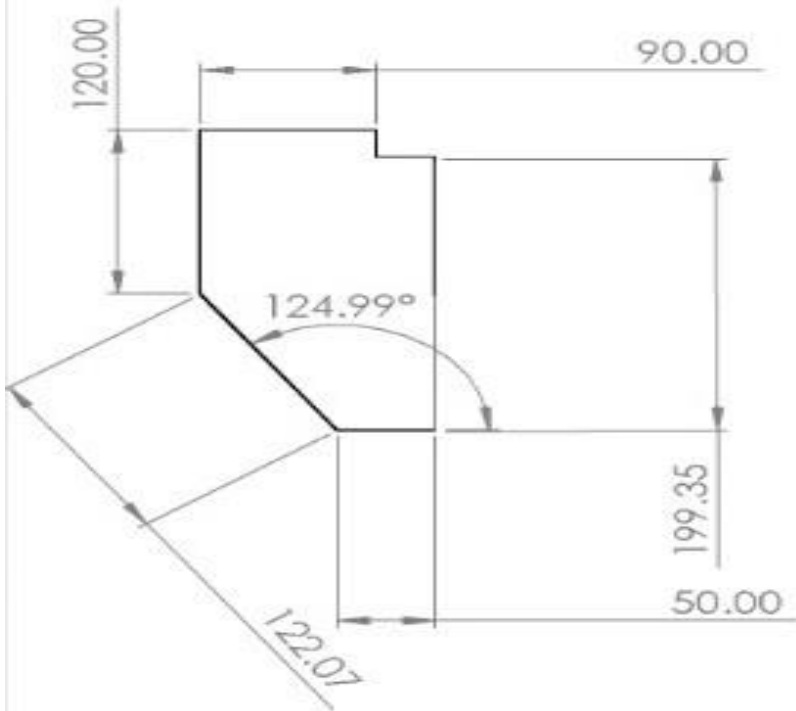


- Part no: 7
- Part Name: Fan Blades and Wheel
- Material : Steel Sheet , Cast Iron
- Quantity: 4 Blades , 1 Wheel
- Dimensions in mm

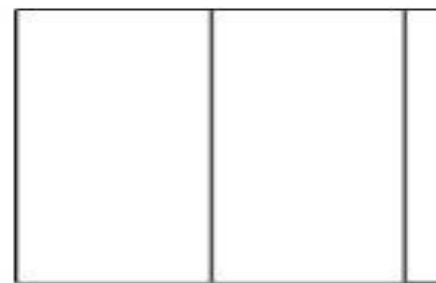
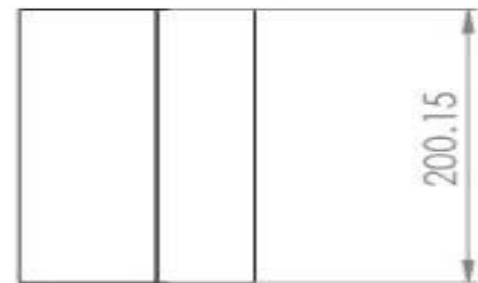
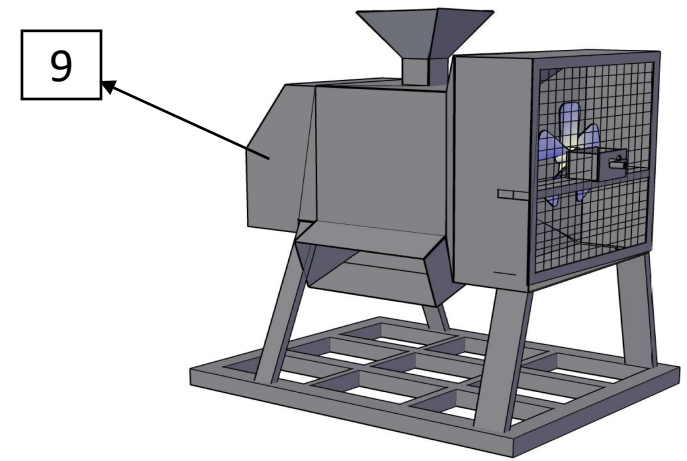
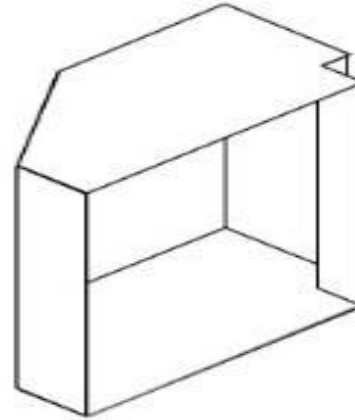


- Part no: 8
- Part Name: Feeding Hopper
- Material : Galvanized Iron Sheet
- Quantity: 1
- Dimensions in mm

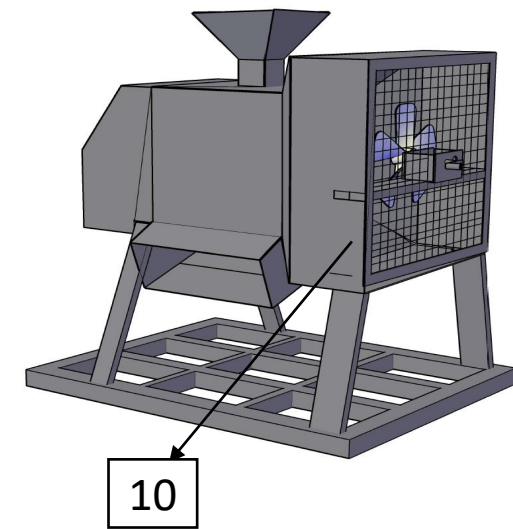
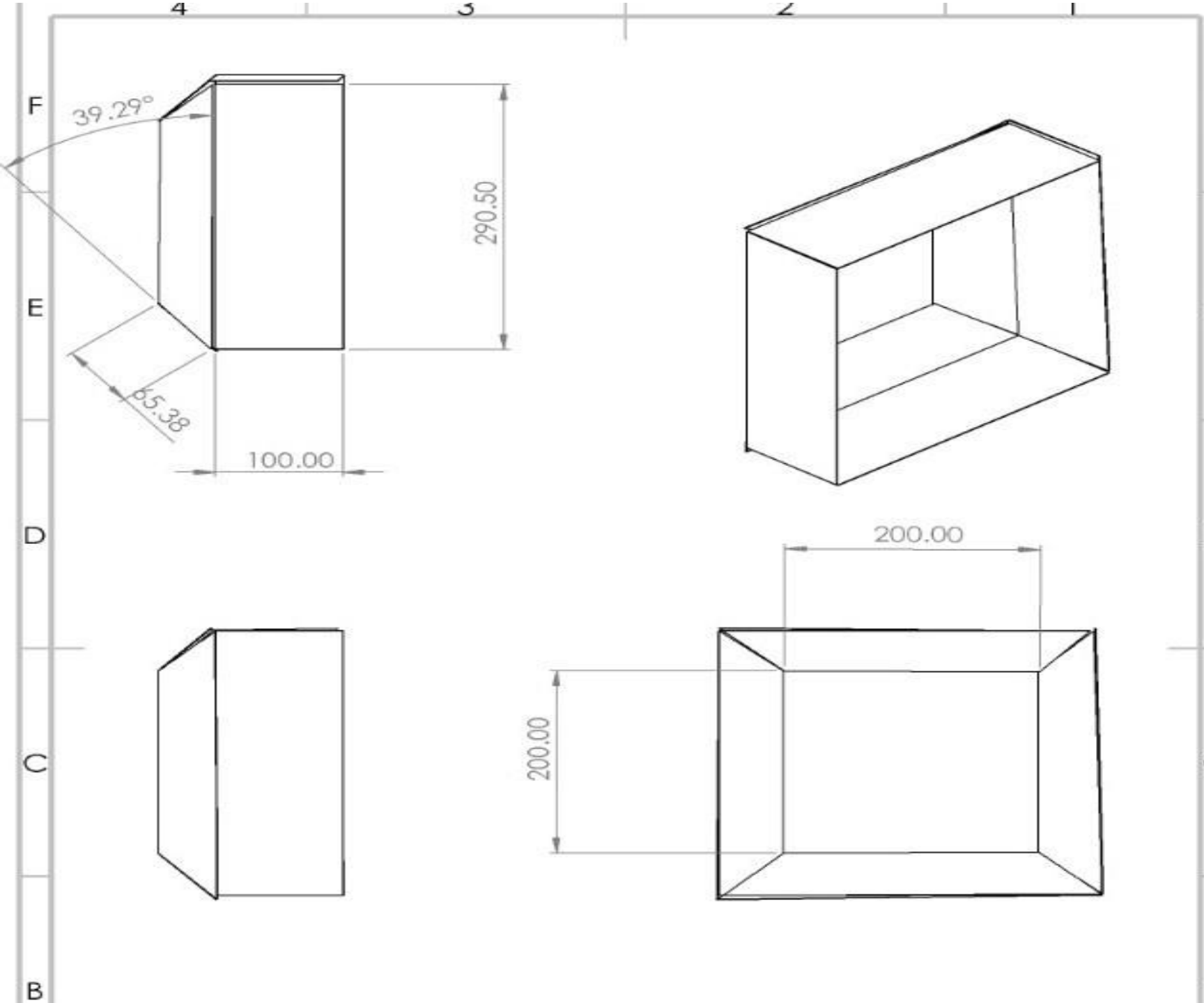




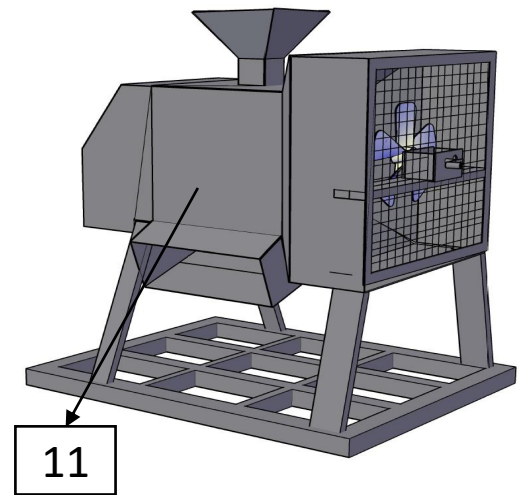
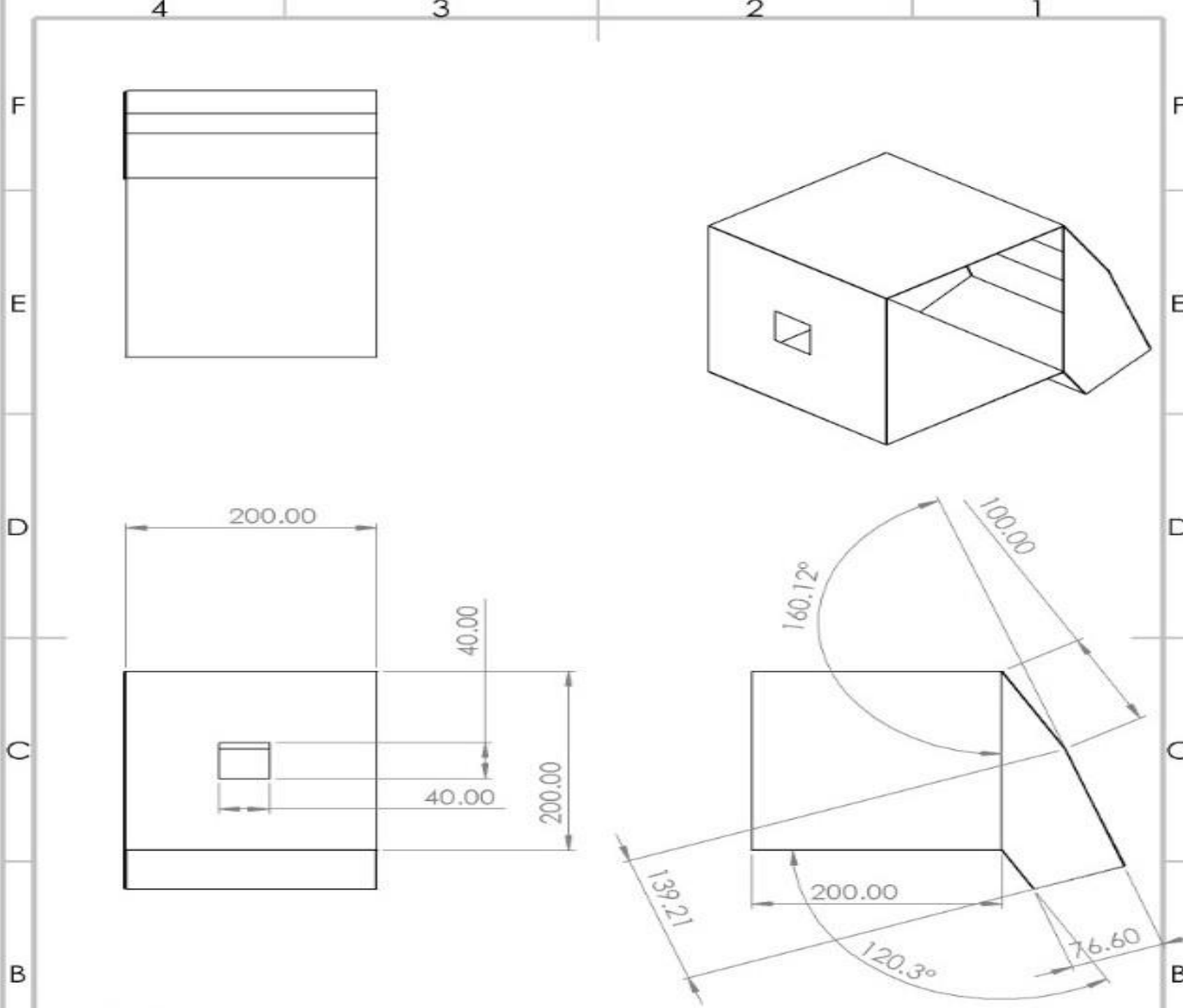
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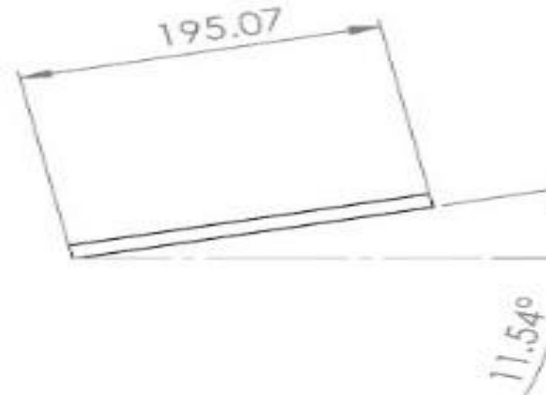
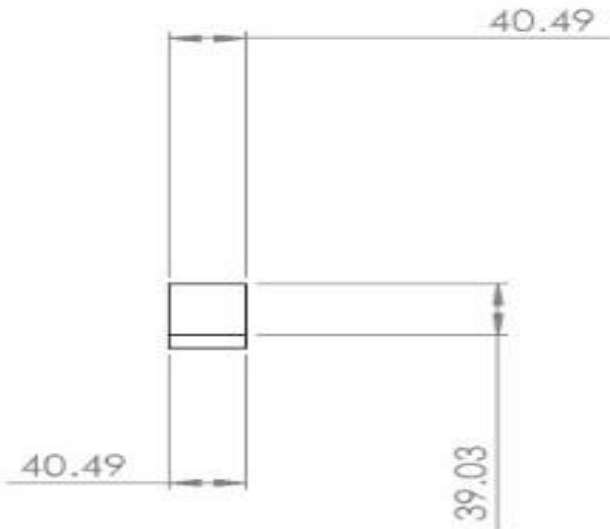
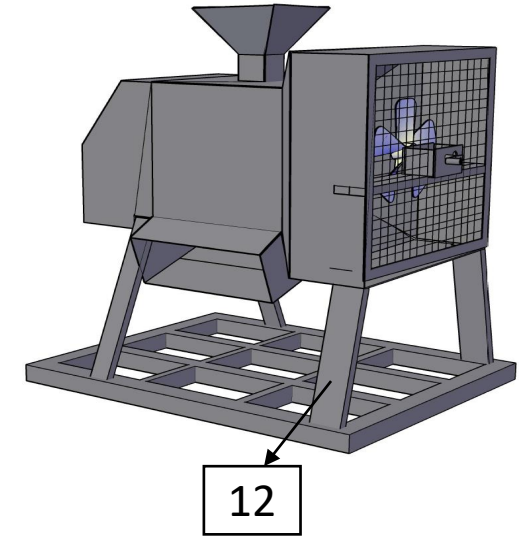
- Part no: 9
- Part Name: Husk Outlet
- Material : Galvanized Iron Sheet
- Quantity: 1
- Dimensions in mm



- Part no: 10
- Part Name: Blower
- Material : Galvanized Iron Sheet
- Quantity: 1
- Dimensions in mm



- Part no: 11
- Part Name: Main Body
- Material : Galvanized Iron Sheet
- Quantity: 1
- Dimensions in mm



- Part no: 12
- Part Name: Supporting Rods
- Material : Steel Square Rod  
10mm
- Quantity: 4
- Dimensions in mm

Part No.	Part Name	Material Used	Manufacturing Processes
1.	Base Frame	Square Rod 10mm	Grinding, Welding, Polishing
2.	Handlebar Handle	Mild Steel Flat 25 X 3 mm Round Pipe 18mm Diameter	Grinding, Metal Bending Grinding, Welding, Polishing
3.	Gears	Cast Iron	Casting
4.	Axle	Mild Steel Round Rod (10 mm Diameter), Mild Steel sheet 1 mm	Grinding, Sheet Metal cutting, Welding
5.	Gear Box	Steel Sheet 1 mm	Sheet Metal Cutting, Deformation, Welding
6.	Wire Mesh	Galvanized Wire 2mm, Steel Angle, Steel Sheet 2mm	Sheet Metal Cutting, Brazing
7.	Fan Blades Fan Wheel	Sheet 1mm Cast Iron Steel	Grinding, Brazing(for joining) Casting, Polishing
8.	Feeding Hopper	Galvanized Iron Sheet	Sheet Metal Cutting, Deformation, Welding, Polishing
9.	Husk Outlet		
10.	Main Body		
11.	Blower		
12.	Supporting Rods	Steel Square Rod 10mm	Grinding, Welding

# Cost Analysis

Part No.	Part Name	Cost (Rs.)
1.	Base Frame	160
2.	Handlebar and Handle	4.4
3.	Gears	13
4.	Axle	30
5.	Gear Box	56
6.	Wire Mesh	30
7.	Fan Blades and Fan Wheel	22
8.	Feeding Hopper	116
9.	Husk Outlet	
10.	Main Body	
11.	Blower	
12.	Supporting Rods	4.08
	Total	435.48

# Sustainability

We have used cast iron, mild steel and aluminium for our model.

- ❖ **Cast Iron:** Cast iron can be recycled indefinitely without any decline in its properties. When it comes to the environmental impacts of mining and refining its raw materials, cast iron is the least damaging cookware material, followed by stainless steel and copper.
- ❖ **Mild Steel:** Steel is very sustainable because once it is made, it can be used forever. Steel can be recycled an infinite amount of times and be used with NO downgrading in quality. The non-renewable resources used to make steel, like minerals and fossil fuels, are not wasted because the steel will be used forever.
- ❖ **Aluminium:** Strong, lightweight and highly recyclable, aluminum is a vital material that keeps the modern world moving. Aluminium is called the green metal because it is a very environmentally friendly metal. Recycling this material saves 95% of the energy required to produce aluminium from raw materials. This means it plays a key role in human ecology.

# Work Distribution

Week Members	Week1	Week2	Week3	Week4	Week5
Parteek (200668)	Discussing Ideas	Research for working of winnowing machine	Research for manufacturing processes involved	Making Presentation doc	
Harsh (200414)	Discussing Ideas	Making project ideas doc	Determining dimensions and materials used	Making Presentation doc	
Harsh Vardhan (200424)	Discussing Ideas	Learning CAD ,doing research for project idea	Solid and Isometric drawing of main body and related parts	Assembly of different parts involved	
Siddharth (200981)	Discussing Ideas	Learning CAD	Solid and Isometric drawings of fan blades and wiremesh	Making orthographic drawings of major parts	
Mehul (200581)	Discussing Ideas	Finding ideas for project	Research for cost of different parts	Finalizing cost of project	
Manas (200555)	Discussing Ideas	Looking for different parts	Solid and Isometric drawing of handle and gear box	Making orthographic drawings	
Dibya (200335)	Discussing Ideas	Research for working of folding bridge	Solid and Isometric drawing of gears	Making orthographic drawings	
Yashwant	Discussing Ideas	Research for working	Isometric drawing of	Making orthographic	