“EXPERIMENTAL ANALYSIS & IMPROVEMENT OF COMPRESSED AIR POWERED VEHICLE”

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ABSTRACT

- The fossil fuel engines which were good enough for us before 30-40 years but now they are one of the sources of contributor of global worming and pollution with fossil fuel crises. The Air Powered Vehicle is an eco-friendly vehicle which works on compressed air. An Air Powered vehicle uses air as a fuel. An Air Powered Vehicle uses the expansion of compressed air to drive the pistons of an engine. An Air Driven Engine is a pneumatic actuator that creates useful work by expanding compressed air. There is no mixing of fuel with air as there is no combustion.

INTRODUCTION

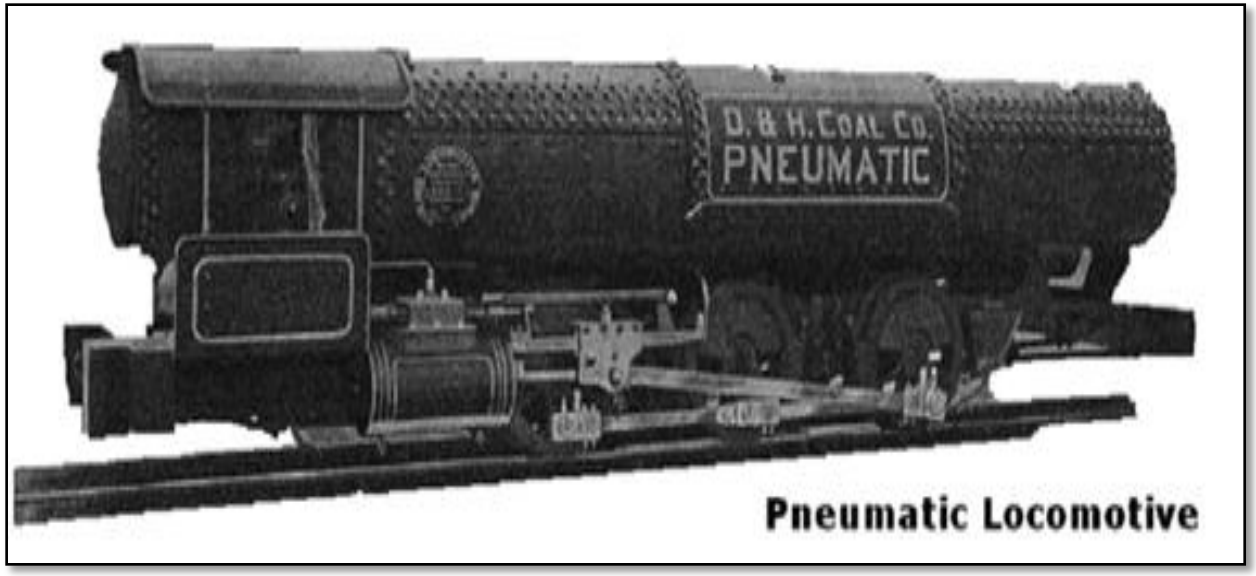
- The Compressed Air Powered Vehicle works on the principle of the Compressed Air Technology(CAT).
- Principle:-
  - Compressed normal air in a cylinder the air would hold some energy within it. This energy can be utilized for useful purposes. When this compressed air expands, the energy is released to do work.

HISTORY

THE PARSEY'S COMPRESSED-AIR LOCOMOTIVE OF 1847

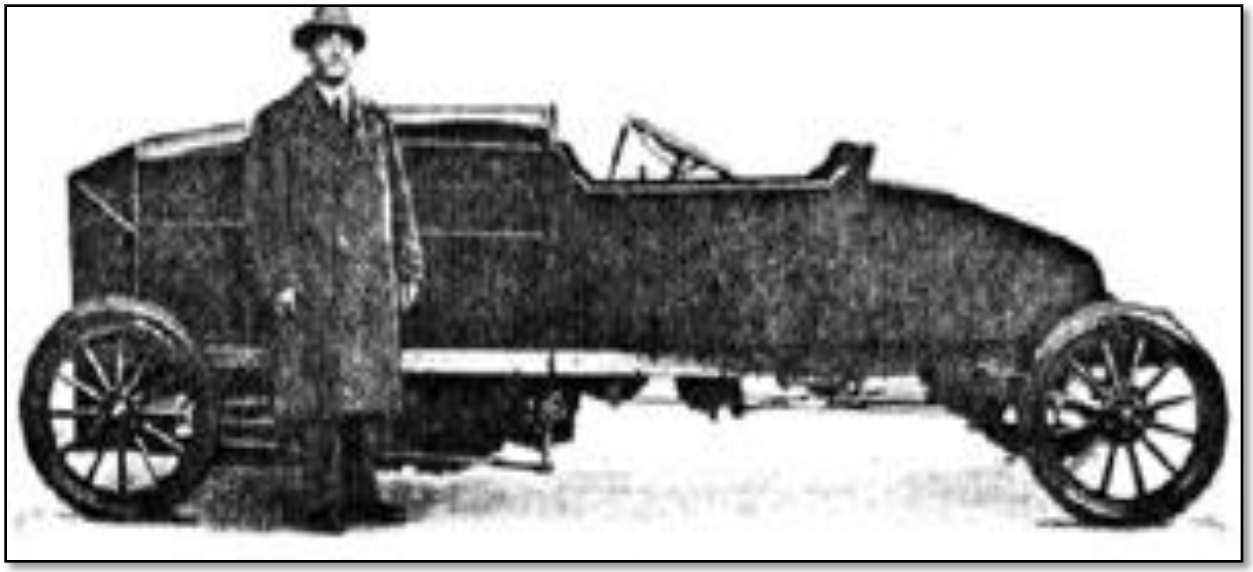
THE MÉKARSKI SYSTEM

PORTER'S PNEUMATIC LOCOMOTIVE



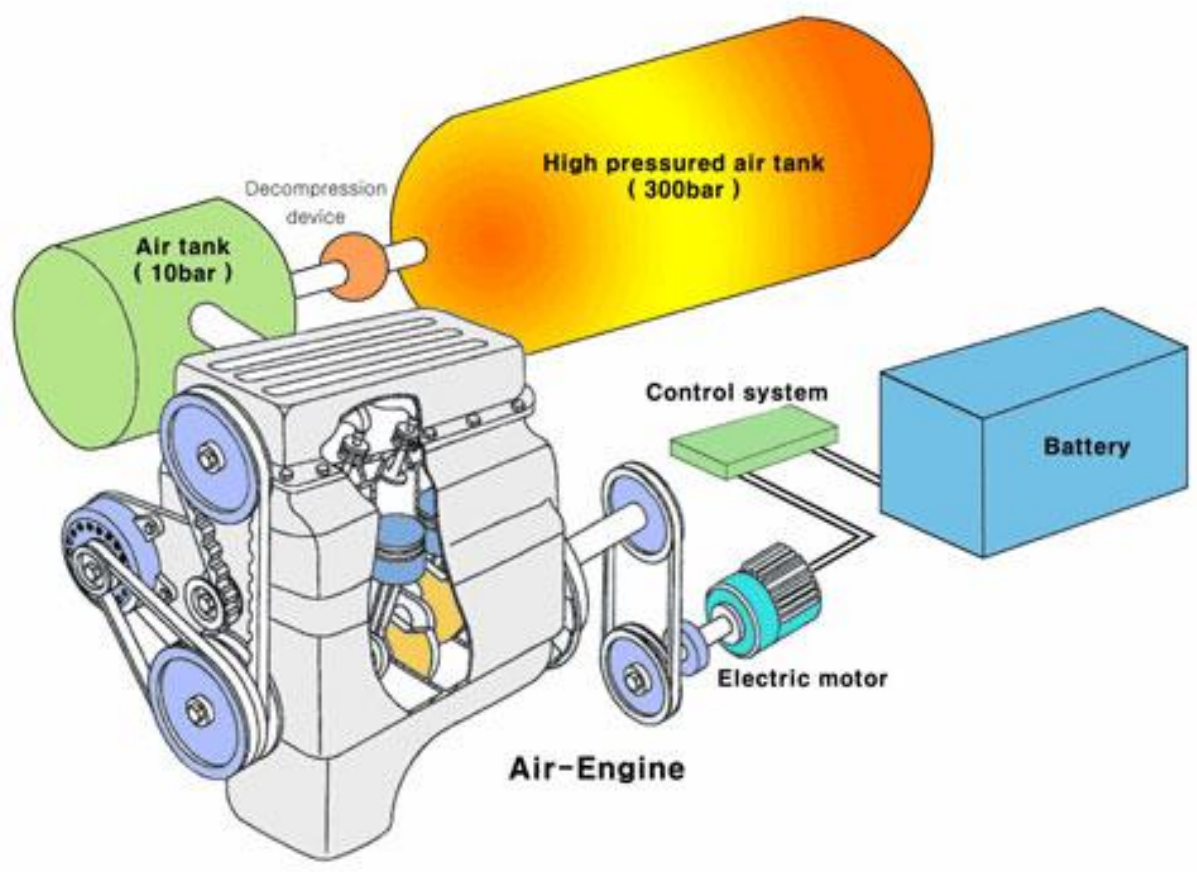
LOUIS'S COMPRESSED AIR SYSTEM

7 LEE BARTON WILLIAMS'S INVENTION



GEORGE MILLER'S AIR CAR

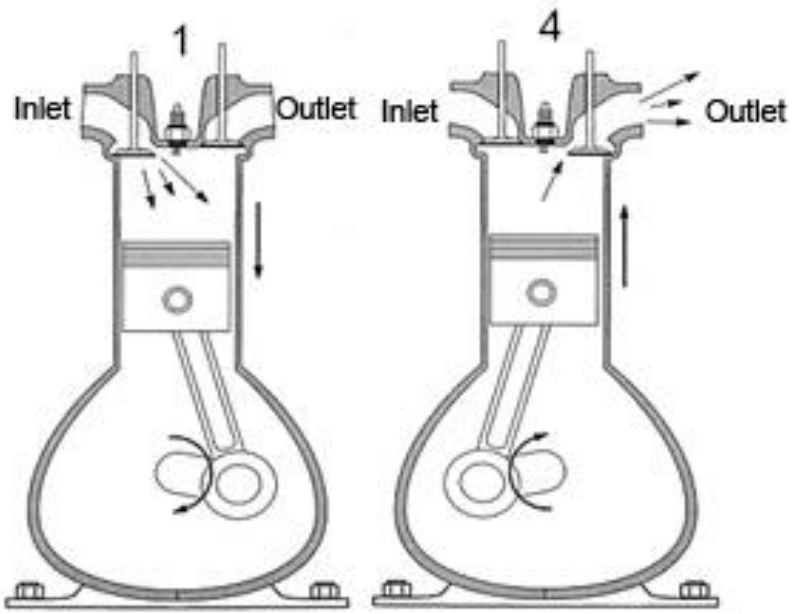
COMPRESSED AIR TECHNOLOGY



COMPONENTS OF COMPRESSED AIR TECHNOLOGY

- AIR ENGINE
- AIR COMPRESSOR
- AIR STORAGE TANK

PRINCIPLE OF AIR ENGINE



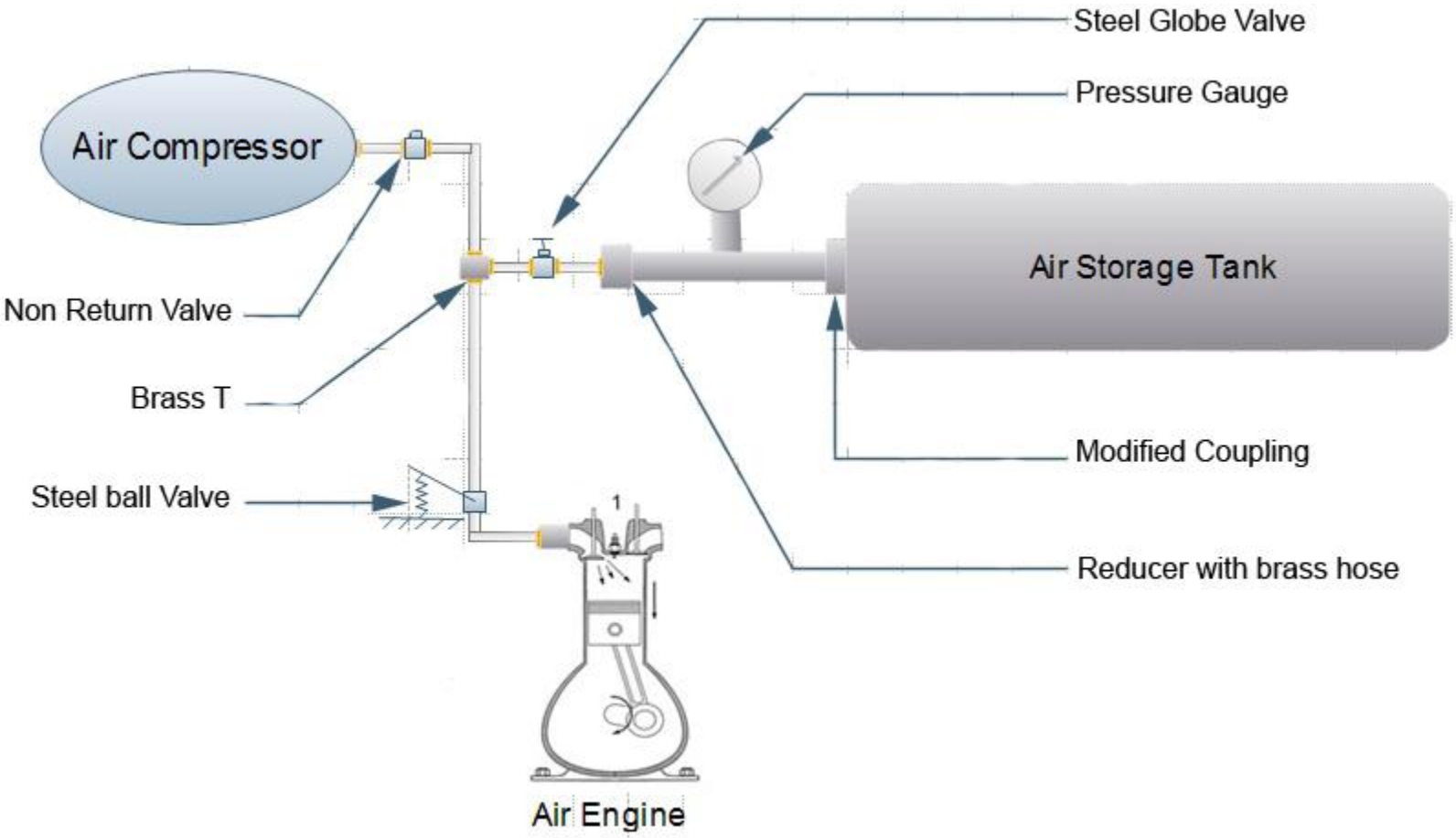
Inlet Stroke

In this storke the inlet valve is open and outlet valve is closed so the compressed air enters and moves the piston downward and gives the power output at the engine shaft

Outlet Sroke

In this stoke Inlet Valve Closed and Output Valve is open so the used Air removes from Cylinder by the output valve to the Atmosphere.

EXPRIMENTAL SETUP



AIR STORAGE TANK

- The storage tank may be made of:
  - Steel
  - Aluminium
  - Carbon fiber
  - Kevlar

COMPONENTS

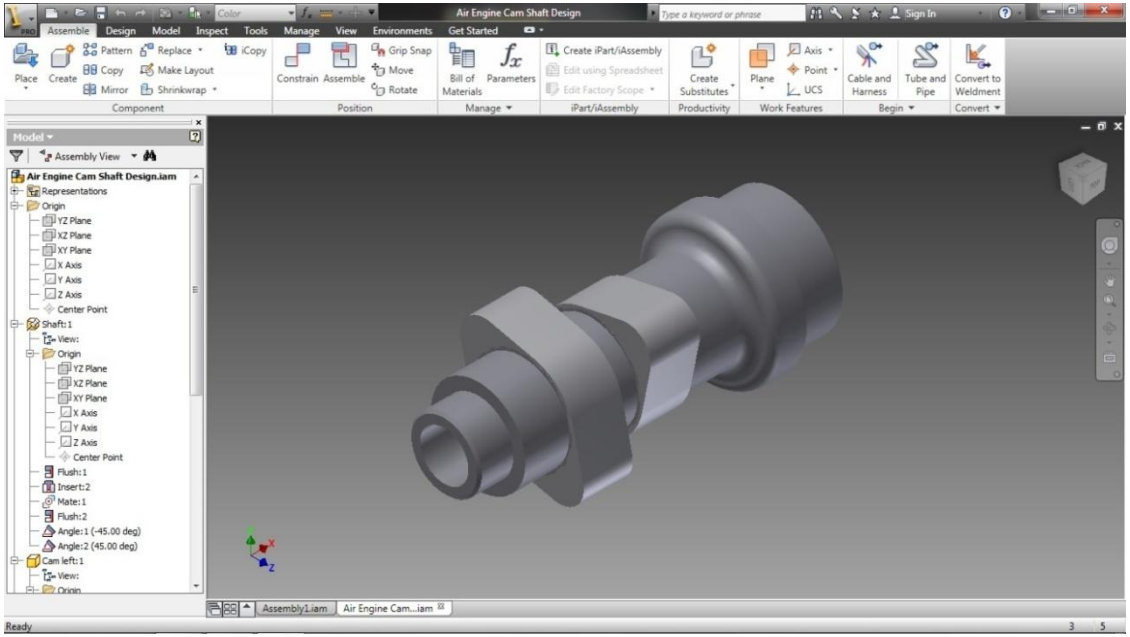
- The experimental setup is consist of following components
  - Engine
  - Compressor
  - Storage tank
  - Piping System
  - Control Valves

THE AIR COMPRESSOR

THE ENGINE

ENGINE HEAD

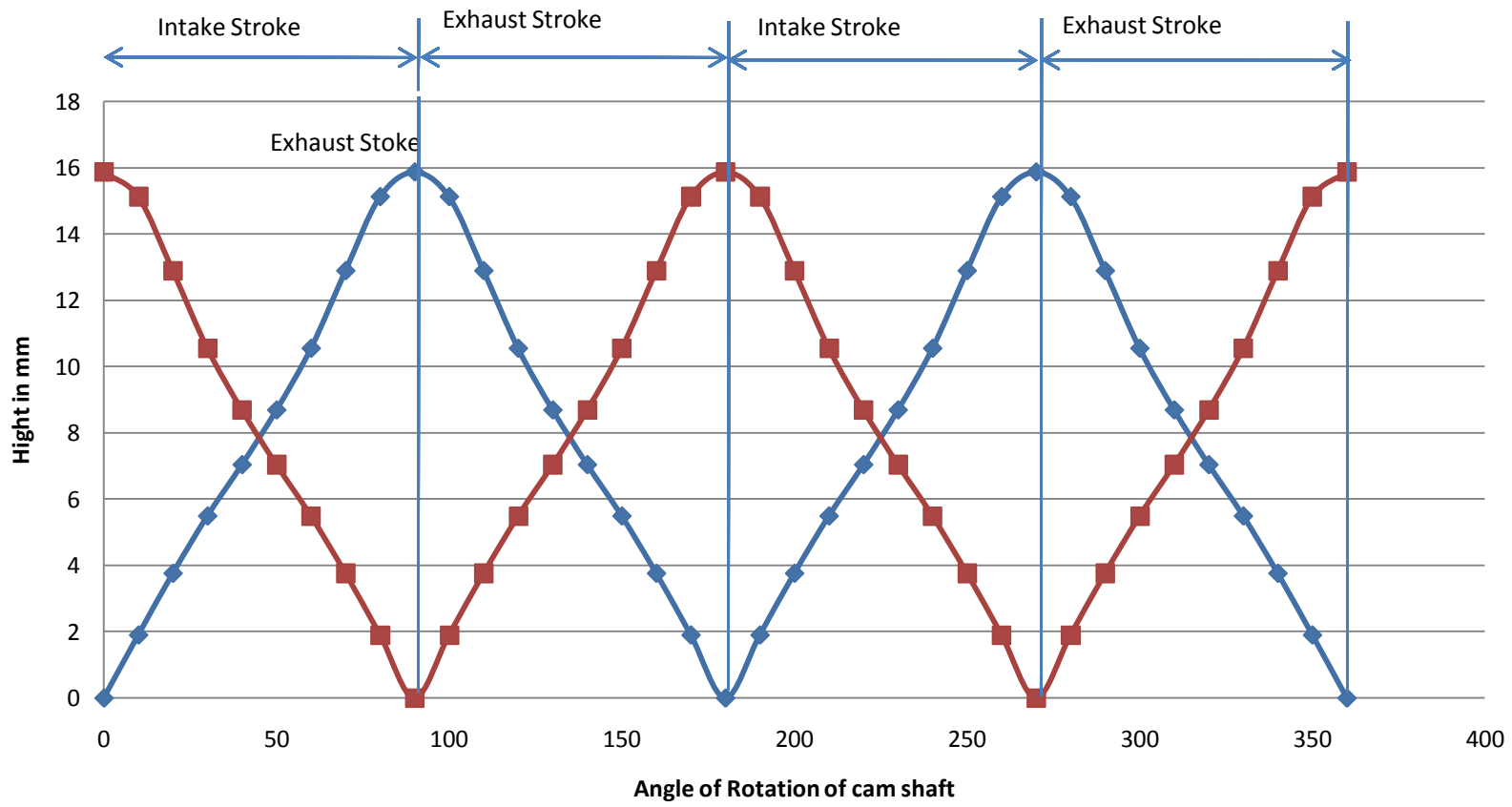
CAM SHAFT



Designed cam shaft for Air Engine

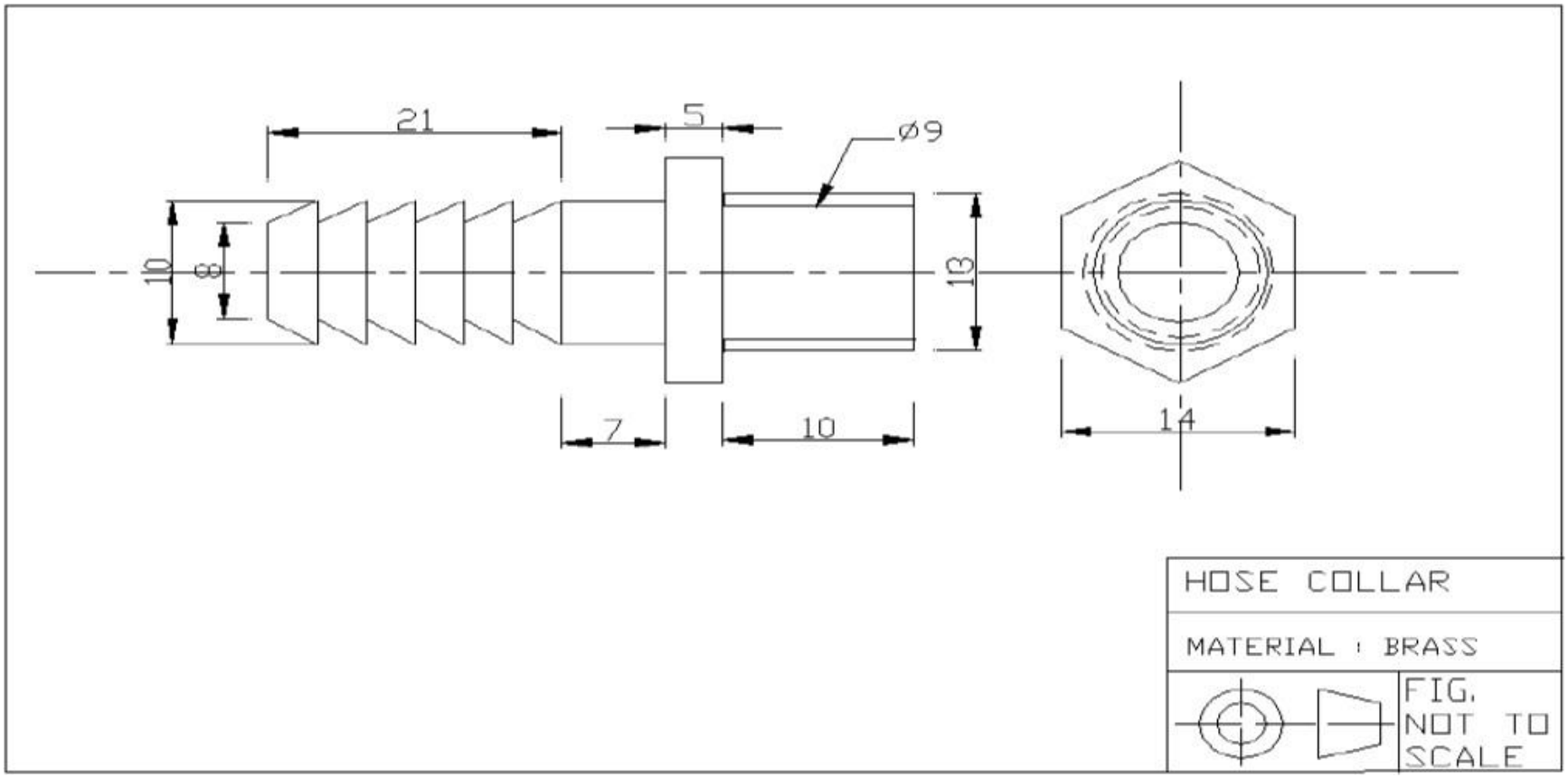
Modified Cam Shaft for Air Engine

CAM PROFILE


Intake Stroke
Exhaust Stroke
Intake Stroke
Exhaust Stroke
Exhaust Stoke
18
16
14
12
10
8
6
4
2
0
Hight in mm
0
50
100
150
200
250
300
350
400
Angle of Rotation of cam shaft

PRESSURE GAUGE

HOSE COLLAR


21
5
ø9
10
8
13
7
10
14
HOSE COLLAR
MATERIAL : BRASS
FIG.
NOT TO
SCALE

CONTROL VALVES

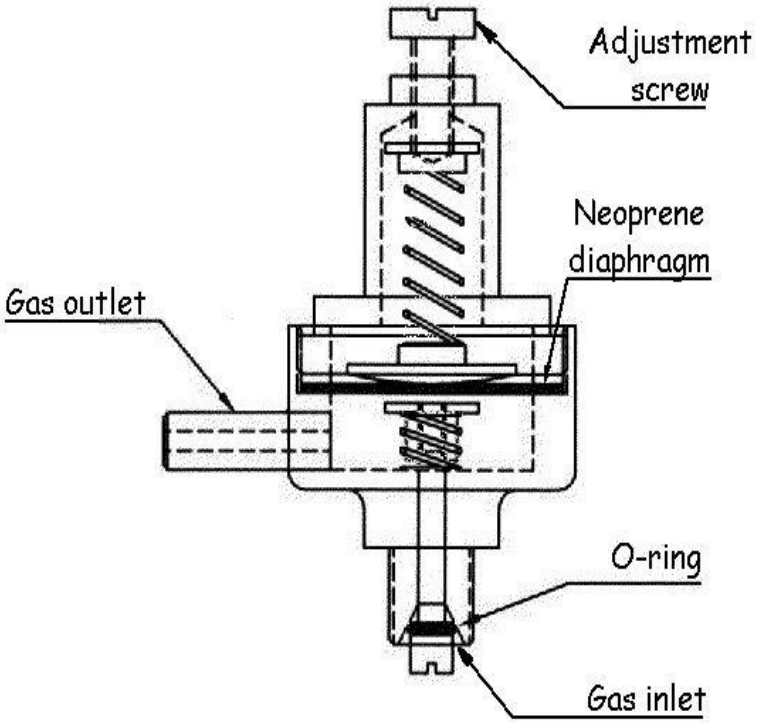
NON RETURN VALVE

STEEL GLOBE VALVE

STEEL BALL VALVE

POLY PIPES FOR AIR SYSTEM

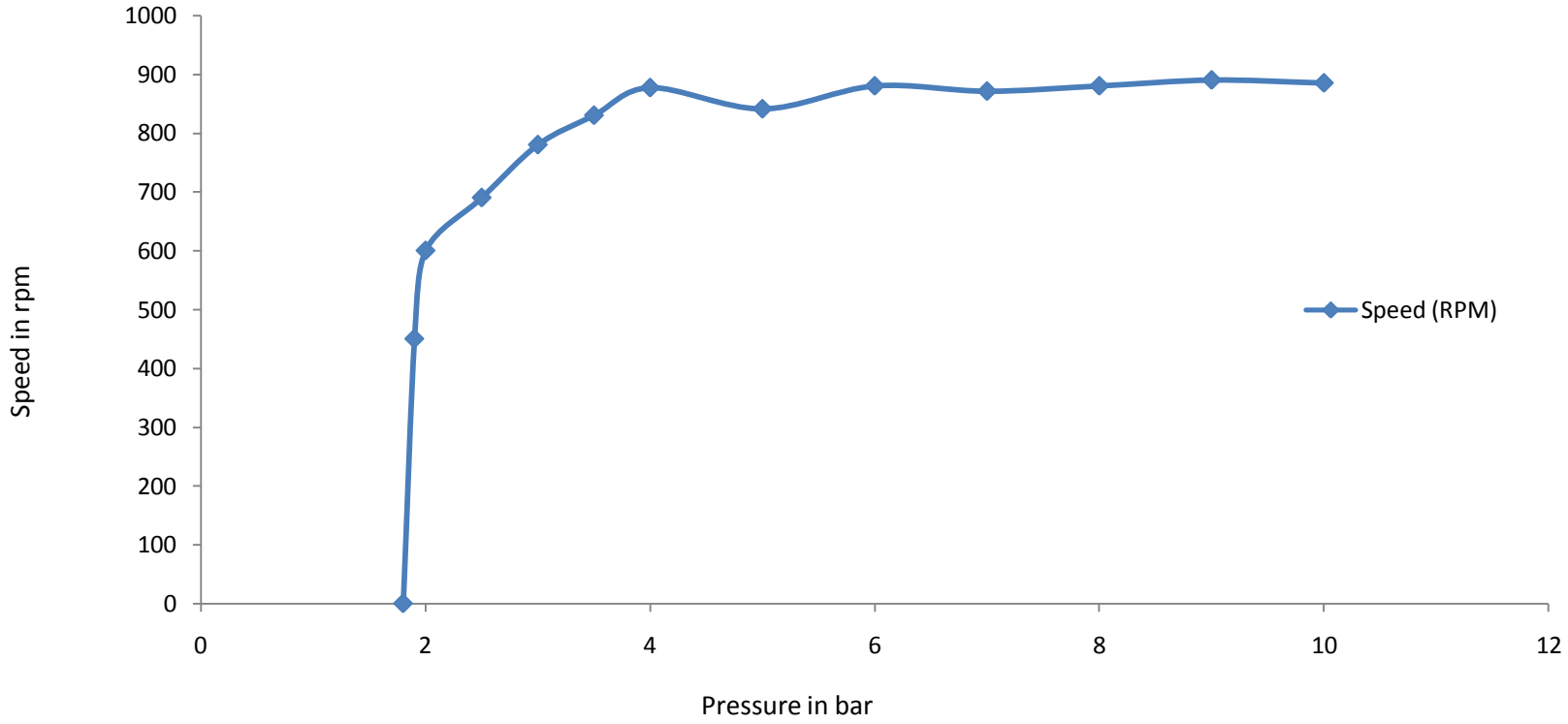
Pressure Regulator



THE PIPE SYSTEM

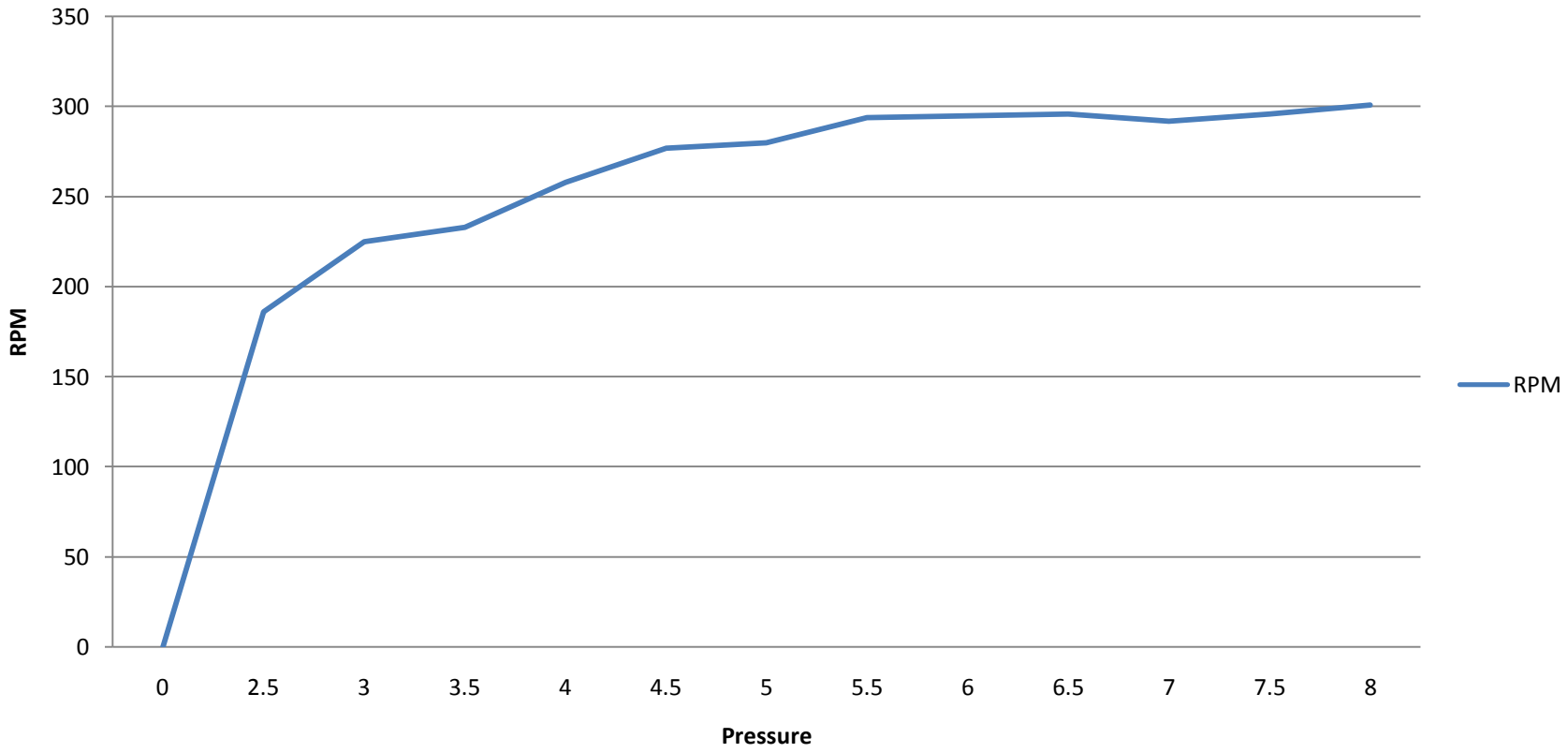
RESULTS AND ANALYSIS

Engine Speed v/s Pressure



Pressure vs. Speed of the air engine

Driving Shaft Speed v/s Pressure



Break Rope Dynamometer

Brake Power

- Brake power ‘BP’ : $\left\{\left[\frac{2\pi N}{60}\right] * \left[\frac{D+d}{2}\right] * [w1 - w2] * g\right\} w$

Where:

w1 = weight added in kg,

w2 = load shown in spring balance in kg,

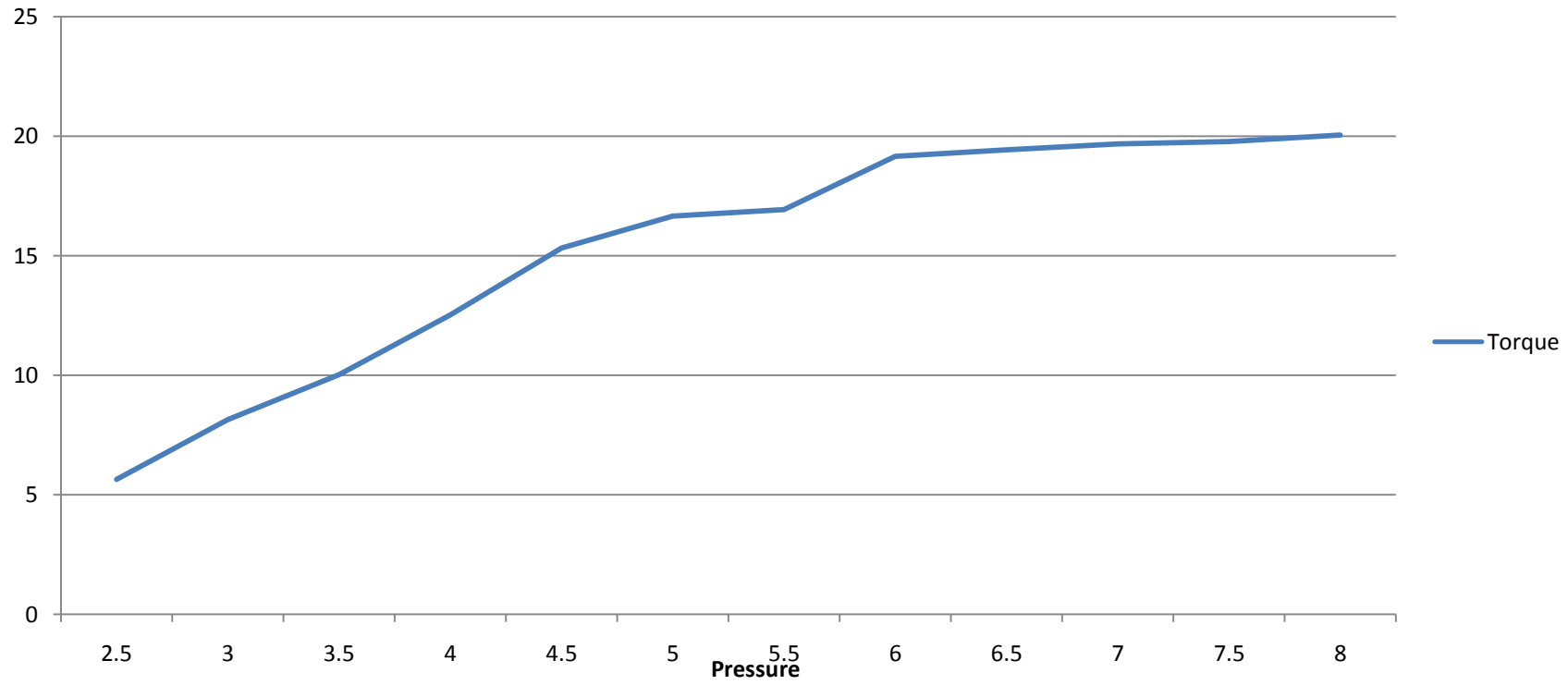
N = speed in RPM,

d = diameter of rope in mm = 10mm,

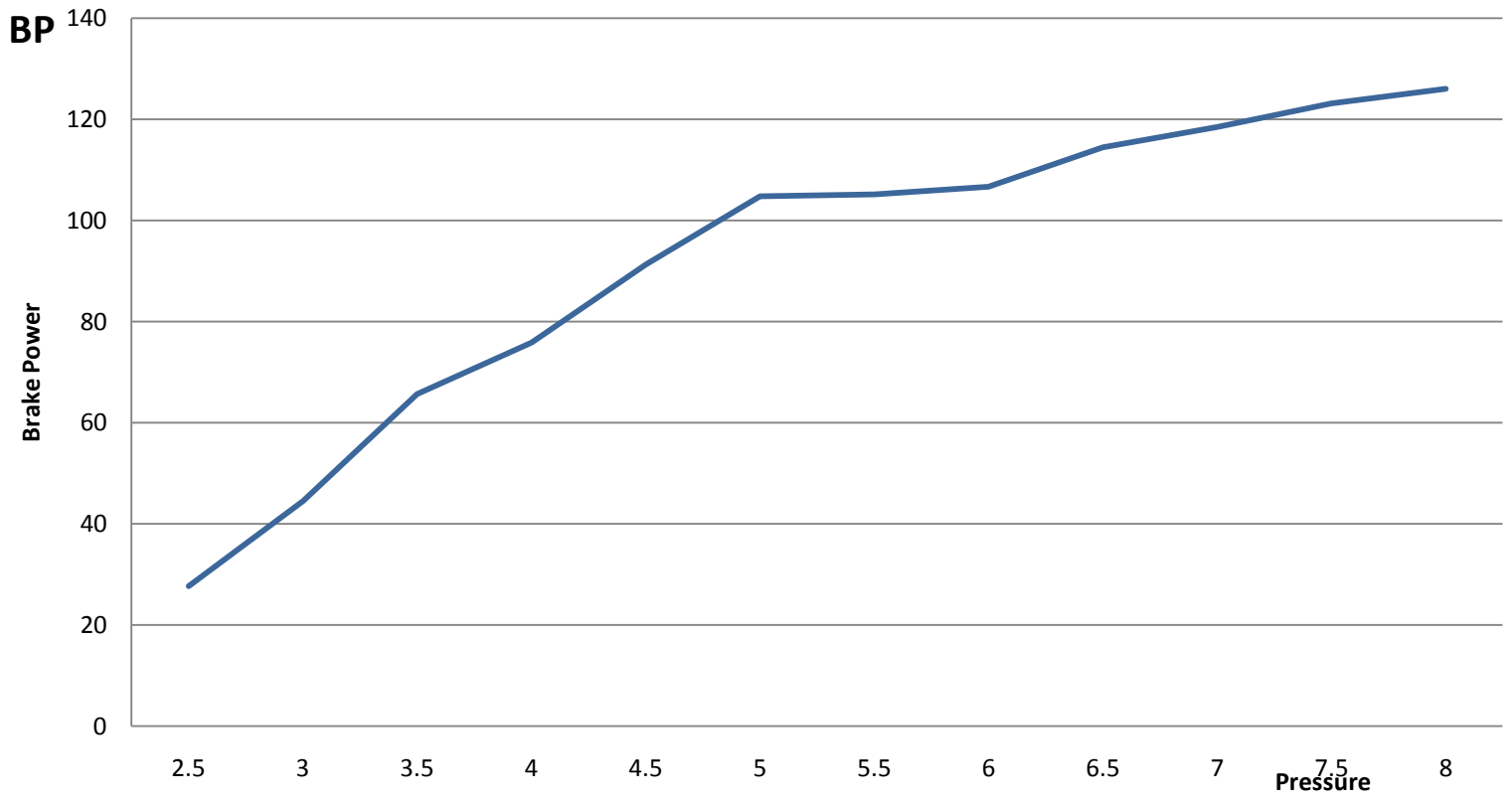
D = diameter of brake drum in mm = 500mm

g = gravitational constant = 9.81.

Torque v/s Pressure

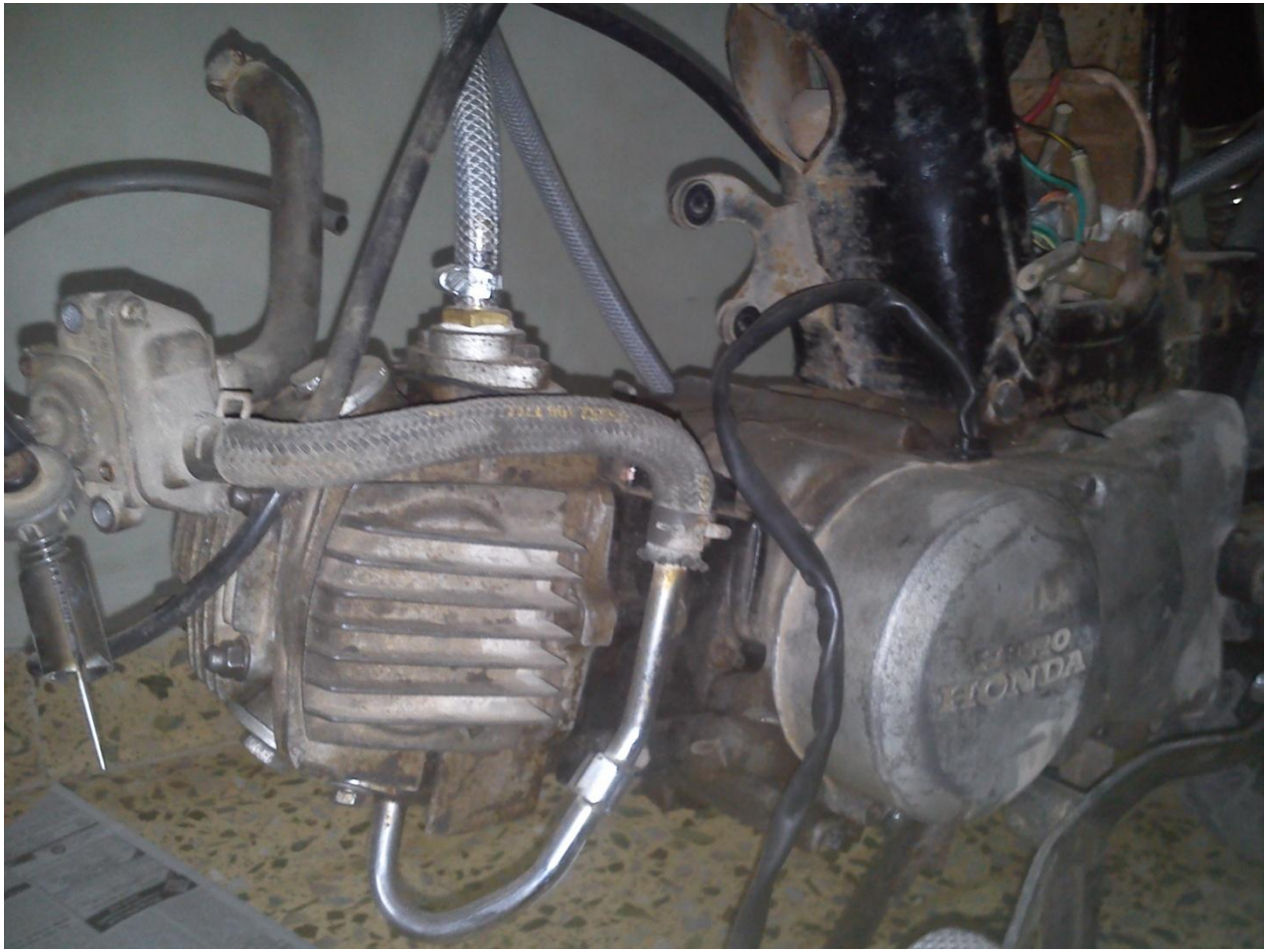


Brake Power Vs Pressure



Finalizing the Vehicle

Engine Fitting



Transmission system

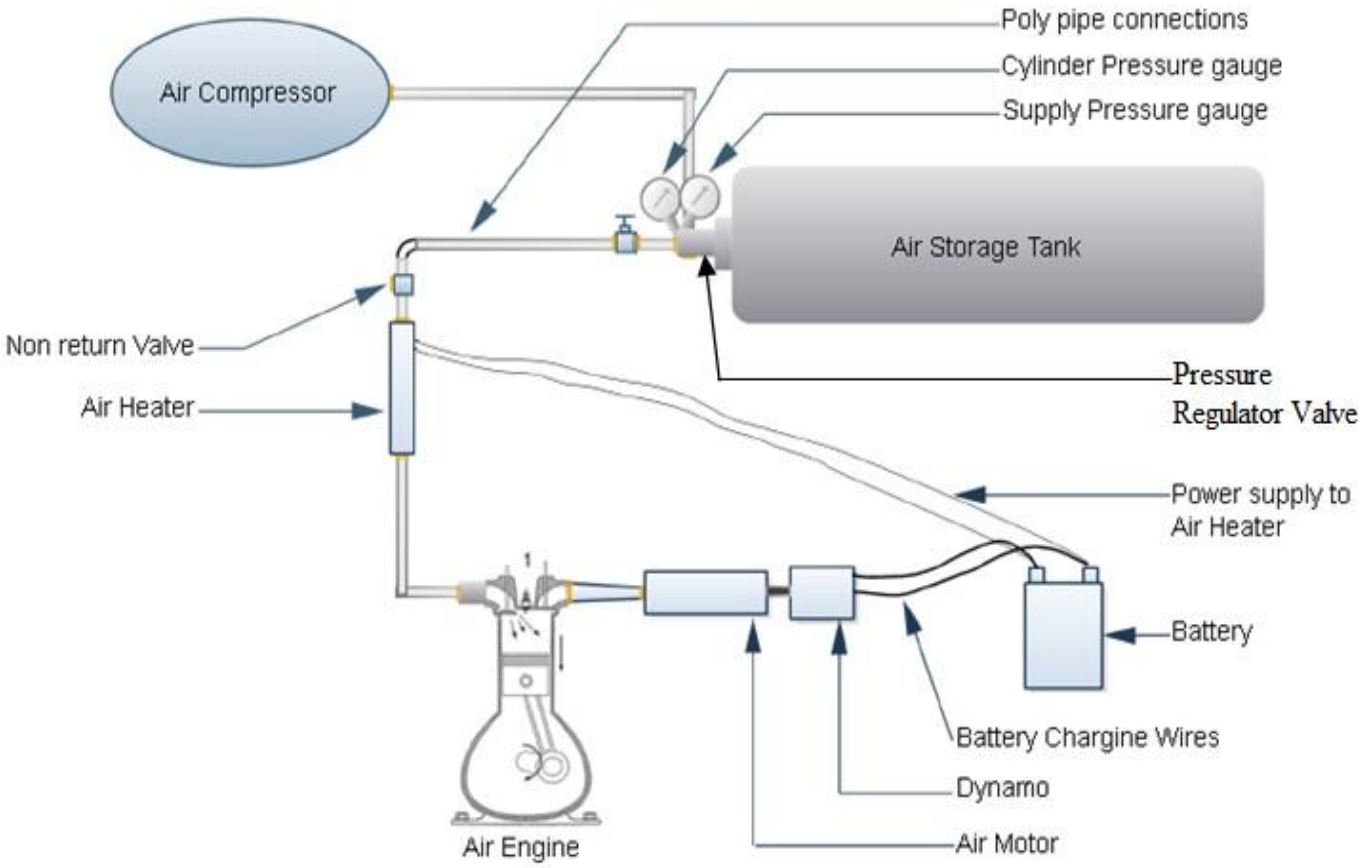
Assembled Vehicle

Back Side View

Compressed Gas/Air Use and Operation

- Reduce the pressure of a compressed gas through a manufacturer's specified regulator attached to the cylinder valve.
- Open cylinder valves slowly with valve outlet directed away from all personnel.
- Never direct compressed air or other gases toward the body.
- Close the main cylinder valve as soon as it is no longer necessary to have it open.
- Before you remove the regulator make sure that the cylinder valve is closed.

REUSE OF WASTE PRESSURE AND IMPROVEMENT IN FUEL EFFICIENCY

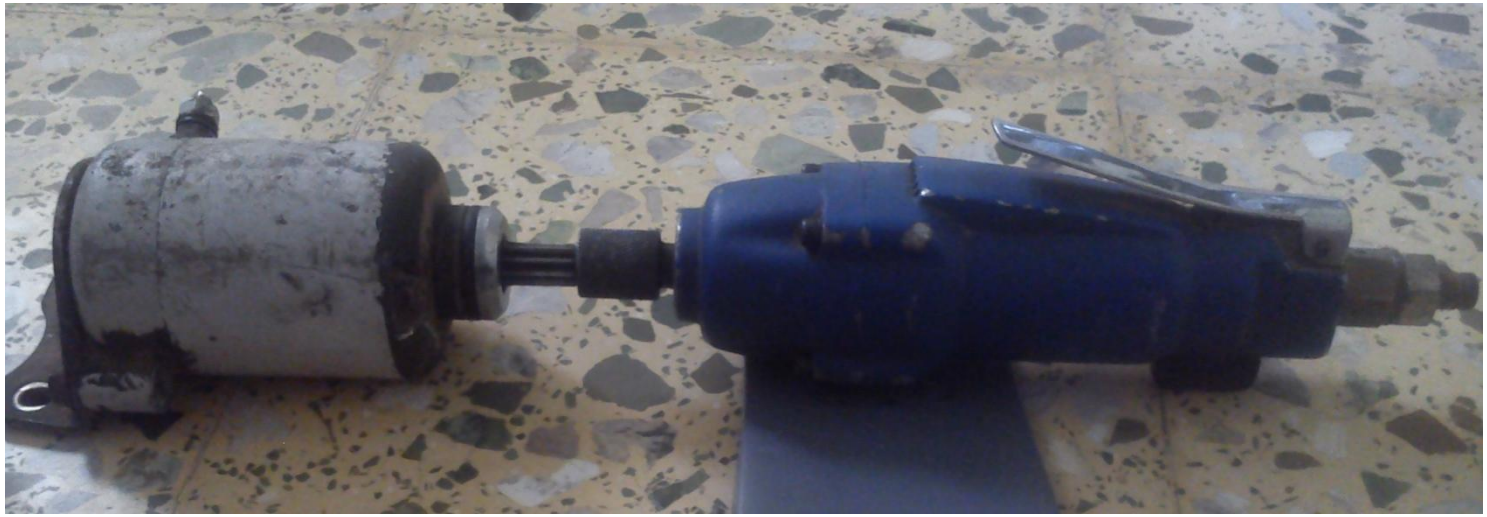


Air Heater

Air motor

The Dynamo

- Connection of shafts of Air motor and Dynamo



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Assembly of Battery and Heater

Assembly of Air Motor and Dynamo

ADVANTAGES

- Economical
- Pollution free
- Better Fuel efficiency
- Better comfort
- Less Maintenance
- Low Cost

DISADVANTAGES

- Less power is produced
- Air pumping stations are less in number

APPLICATIONS

- THREE WHEELER
- MOTORCYCLES
- MOPEDS
- CARS
- BUSES
- LOCOMOTIVES
- TRAMS

DEVELOPERS & MANUFACTURERS OF COMPRESSED AIR ENGINE / COMPRESSED AIR VEHICLES

- MDI (Motor Development International)
- TATA motors
- Air Car Factories SA
- NISSAN
- Ford
- Kia
- Energies corporation (a south Korean company)
- Engine air (an Australian company)
- HONDA
- Mercury

CONCLUSION

- We were able to successfully complete the design and modification of the Petrol Vehicle in to the Compressed air vehicle.
- The Air Vehicle provides an effective use and applied to the transportation light vehicles. It's speed, range and the power are limited now, so further research could provide more effective results.
- This project can be directly utilized in the market to modify IC Engine bikes in to the Air bikes in effective cost. Since a number of operations can be performed in a single and simple unit. It is efficient and economical.
- We can say that the cost of the modification is very less and the effective results can be achieved.

- As we know that in IC engines higher pressures and temperatures are maintained as compared to air driven engine so that in IC engines heavy metal alloys are used but for air driven engine light alloys can be used.
- The weight of the engine can be reduced by using aluminium and more light metals. Also the new modified engine and chassis, cast from light alloys can be lighter which will design for the air engine.
- The use of heater and reuse of exhaust air improves the efficiency of the vehicle.
- This project is a successful one because we have stared the 4 Stroke petrol vehicle is running only on compressed air.

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Please Ask Your Questions…


Thank You...!!!