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DESIGN AND FABRICATION OF POWER HAMMER

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ABSTRACT

Power hammers are mechanical forging hammers that use a non- muscular power source to raise the hammer preparatory to striking, and accelerate it onto the work being hammered. A typical power hammer consists of a frame, an anvil, and a reciprocating ram holding a hammer head. The workpiece is placed on the lower anvil and the head or upper head strikes the work piece. The present project work is a design and fabrication of Power hammer. This machine is used to break a brick into small pebble size. This project involves the process of designing a power hammer by using crank and lever mechanism. This project is mainly about generating a new concept of breaker that would make the work easier and reduce the work of man power. The sole purpose of this project is to understand the fundamental knowledge of crank and lever mechanism

INTRODUCTION

Power hammers are mechanical forging hammers that use a non-muscular power source to raise the hammer preparatory to striking, and accelerate it onto the work being hammered. Also called “open die power forging hammers”. They have been used by blacksmiths, bladesmiths, metalworkers, and manufacturers since the late 1880s, having replaced triphammers.

A typical power hammer consists of a frame, an anvil, and a reciprocating ram holding a hammer head or die strikes the workpiece. The power hammer is a direct

descendant of the trip hammer differing in that the power hammers stores potential energy in an arrangement of mechanical linkages and springs, in compressed air or steam, and by the fact that it accelerate the ram on the downward stroke. This provides more than simply allowing the weight to fall. Predecessors like triphammers, steam drop hammers,

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board or strap hammers, used the power source to raise the ram or hammer head, but let it fall solely under gravity.

Power hammers are related by weight of moving parts that act directly on the workpiece. This includes the weight of the parts that may consists of upper die, ram, mechanical linkages arms and springs or ram, piston, and associated connecting rods. Specific design elements are dictated by the power source. The largest power hammer was powered by steam and was rated at 125 short tons.

The different types of power hammer are generally categorized by their power source Steam, Mechanical, Air.

Steam and mechanical power hammers were made into the middle of the 20th century in the United States. At the end of the 19th century the mechanical power hammer became popular in smaller blacksmith and repair shops. These machines were typically rated between 25 and 500 pounds of falling weight. Many may still be seen in use in small manufacturing and artist-blacksmith shops today. In the middle of the 20th century power hammers driven by compressed air began to gain popularity and several manufacturers are currently producing these hammers today.

Methodology

The Operations of the project are as following:

1. The power hammer used for the tool brazing operation.
2. Forging.
3. Drawing.
4. Punching.
5. Flattening or Setting down
6. Cutting.
7. Fullering.
8. Edging

All these operations are carried out with the metal in a heated condition, which must be maintained by taking a ‘fresh’ heat when the work shows sign of getting cold. Forging Processes the processes of reducing a metal billet between flat-dies or in a closed impression die to obtain a part of predetermined size and shape are called smith forging and impression-

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die forging respectively. Depending on the equipment's utilized they are further sub-divided as hand forging, hammer forging, press forging, drop forging, mechanical press forging, upset or machine forging. Press working involves production of final component from sheet metal in cold condition.

The machine which is used to apply the required pressure of force in a short duration is called press. The press consists of a frame, supporting bed and ram. The ram is equipped with special punches and moves towards and into the die

LITERATURESURVEY

Steam and mechanical power hammers were made into the middle of the 20th century in the united states. At the end of the 19th century the mechanical power hammer became popular in smaller blacksmith and repair shops. These machines were typically rated 25 and 500 pounds of falling weight. Many may still be seen in use in small manufacturing and artist blacksmith shops today. In the middle of the 20th century power hammers driven by compressed air began to gain popularity and several manufactures are currently producing these hammers today.

At present the demand for large open die forgings has decreased. New investments for building-up new facilities of large forging shops depend on current orders. The article surveys the state of chosen forging plants both in the world and in the Czech Republic. The forges for manufacture open die forgings have a wide spectrum of products, in terms of shape and size, materials, and the spectrum of customers. There is a single-part production or short- run production at best. Most forgings are intended for external customers in machined and unmachined states. Only of a small part of forgings, we can say that the interest in them is stable. Sales of the most of them vary during long periods. As a typical example of that fact we can mention forgings for nuclear power plants. 30-40 years ago the capacity of the most of our manufacturers of open die forgings were overloaded by them, and then the interest in them dropped almost to zero, but recently the interest has increased again. Large fluctuations in demand occur also with forgings for shipbuilding industry and with certain other forging groups.

[1] Inventor: Edward L Allen, Jr Albert F Gattiker [published o1963-08-08]

The principal object of this invention is to provide a handy portable power tool which will simultaneously rotate and hammer a tool implement and also. selectively rotate the tool implement without hammering it or hammer it without rotating it. Other important objects of this invention are: to provide a lightweight, inexpensive, and relatively simple power tool impact mechanism; to provide a novel impact mechanism which can be quickly and easily

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converted from applying axial impacts without rotation to applying axial impacts with rotation; and to provide a new type of power hammer.

the objects of this invention are provided by driving a pair of carriers through an epicyclic gear train wherein they can be locked against rotation alternately, providing a means for locking the carriers alternately, mounting a mechanism between the carriers to provide a hammering action resulting from relative rotation between the carriers and mounting an implement holder on one of the carriers. When the carrier holding the implement is rotated, the tool simultaneously rotates and hammers the implement. A mere hammering action is obtained when the other carrier is rotated.

[2] Inventor: H Smith [published1973-09-10]

An automatic nailing machine having a vertically reciprocable hammer normally urged downwardly, liftable by a motor-driven pinion twice each revolution of the pinion, normally latched in its upright cocked position but releasable by the pinion when a hand- operated trigger is actuated, for intermittent or repeated hammering operations. The hammer head is removable from the hammer slide.

In the present device, the cycle provides for continuous repeating operation at will or intermittent operation at will, and in both cases the control is mechanical without requiring starting and stopping of the electric motor drive. While this concept is broadly shown in prior art, in the present arrangement, the manually operated trigger only releases the trip mechanism so that it can be operated by the pinion. By this construction, there can be no manual release of the hammer that permits it to descend by the spring and crash against the gearing. Also there can be no hazardous accidental release of the hammer if its motor has been turned off adjusted to take up wear should .it occur. The hammer element itself can be replaced

[3] Inventor: Edward W Ristow [published on1956-12-17]

The primary objective of this invention is to provide an improved power hammer assemblage which is simple and compact in construction and highly effective in use. To provide an improved portable motor driven hammer unit in which a reciprocable impact member is most effectively and rapidly actuated by a rotary power-driven element. To provide an improved power hammer assemblage in which the striking member is operated from a power source such as an electric motor through gearing and a one-way friction drive which effectively protects the gear teeth against local wear and injury due to the repeated impact blows delivered by the hammer. To provide a simple and sturdy peening hammer of themanuallymanipulableportabletypewhichmaybemanufacturedandsoldfordiverse

uses at moderate cost, and which is safely operable at maximum efficiency. To provide a durable hammering device especially adapted to close seams along sheet metal duct assemblages or the like by delivering rapid successive blows against the work through an

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impact member adapted to be repeatedly retracted by a gear driven rotary element having the gear teeth most effectively protected by a simple drive adapted to uniformly distribute the wear there on.

[4] Inventor: William R Jenkins [published on1902-07-26]

In a power-hammer, the combination with a helve, of a cylinder, an automatically operating inlet and a separate outlet valve at one end of the cylinder, at plunger in the cylinder connected with the helve so as to draw air into the cylinder when the helve rises and means for regulating the escape of air from the cylinder through the outlet valve when the helve descends. In a power-hammer the combination stroke of the hammer, a catch-up for the hammer and means for simultaneously operating said catch-up and regulating the cushion of the stroke of the hammer at the will of the operator. In a power-hammer, the combination with a helve, of means for raising the helve, a cylinder having an automatically-operating inlet check-valve at one end, a plunger in the cylinder connected with the helve, a separate outlet-valve at the same end of the cylinder as the check-valve to regulate the escape of air from the cylinder beneath the plunger, and a treadle for operating valve.

[5] Inventor: Cordes Hugo [1935-07-07]

In a Diesel power hammer, in combination a housing containing a combustion chamber, a hammer block formed with an structure extending through the bottom of the housing, an impact body movably mounted-in the housing and formed with a reduced piston to fit the combustion chamber and adapted to strike the hammer block, the impact body and hammer block having centrally disposed impact faces, said housing having a fuel receiving space laterally of the impact face of said hammer block, a means for injecting fuel into the space, means for admitting air to combustion chamber, and means for raising said impact body in said housing for starting purposes.

In a Diesel power hammer, in combination a housing containing a combustion chamber, a hammer block formed with an structure extending through the bottom of said housing, an impact body movably mounted in said housing and formed with a reduced piston to fit said comb usher and pitted to strike the hammer means for ' injecting' fuel into the space, means

for raising the impact body in the housing for starting purposes, means for securely guiding 5 said impact body in the upperpart of said housing, the latter being so dimensioned as to permit the piston part of said impact body to completely leave said combustion chamber after each impact thereby" admitting scavenging air to said 10 combustion chamber.

[6] Inventor: Lucius T Everett[1940-04-23]

This invention relates to improvements in portable power hammers of that type in which the percussive force is determined by the pressure exerted by the operator in holding

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the hammer to the work. Such portable power hammers have gone into extensive use in many arts including marble working and sculpturing. However, the prior apparatus has been open to the objection that dust and dirt enters through the nose-end of the apparatus around the tool shank and in time interferes with the operation of the apparatus, so that at intervals it is necessary to dismantle the apparatus and cleanit.

In a power-hammer of the type whose percussive force is determinable by the pressure exerted by the operator in holding the hammer to the work, said power hammer comprising a reciprocable plunger and a tappet to which the plunger imparts its blow, a nose-construction for said hammer comprising a tubular nose-end on the power hammer, a nose-bushing-within the nose-end and having an enlarged-compartment at its outer end and a radially inward extending relatively thick flange at its inner. and provided with a central opening, a tool-holding device arranged to fit closely and yet be movable longitudinally in said central openings of the flange, said "tool-holding device being provided with a flange arranged to travel in the enlarged compartment of the nose-bushing and being tubular part of the way from its flanged end to receive a tool shank and having its other end closed by a relatively thick solid wall, arranged to receive and transmit thrust from the tappet, a helical compression spring located in the space between the tool-holding device and the inner wall of the nose-bushing, said spring being restrained at one end by the flange of the nose-bushing and at the other end by the flange of the tool-holding device, and a nose having a central opening to admit a tool and threaded into the nose-end of the power hammer, said nose being arranged to limit the outward movement of the tool-holdingdevice.

[7] Inventor: Leland E. Gillan, Robert J. Wagner[1990-02-26]

A compact power hammer that can be used to drive post easily and safely by one person as well as for use with other impact tools. The invention is comprised of a cam lifting a hammer and dropping it onto an anvil. The impact on the anvil is transferred to the post or impact tool by way of the center tube head. The center of gravity of the impact device is below and, in the post, or impact tool. This invention was designed to solve the problems of power driving fence posts in remote applications or for a single person operation without the use of additional equipment. This invention can be easily adapted to other more conventional uses such as a tamper or powerchisel.

To have the impact means centered around the object to be impacted. In the example of the post this accomplishes two objects. The first is a very safe and stable operation. Second the impact energy is put axially into the top of the post with no concern for misalignment and loss of energy. To be light weight and hand carried for remote applications. The invention can definitely be hand carried and durable with its compact rugged design. To be adaptable to different uses such as driving posts, tamping soil around posts or as a power chisel. This gives the invention versatility and added value to its owners.

[8] Inventor: Frank P Miller, Skeel Lewis [1927-03-14]

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This invention relates 'to power' operated hammers of the type in which av compressible power transmitting medium is employed between the 'driving and driven members. Briefly stated an important-object of this, invention is to provide an air hammer in which the construction of parts is such that the cost of manufacture is substantially reduced as compared with other hammers of which we know and in which novel means are provided to avoid loosening of various parts of the hammer as a result of vibration incident to use.

CRANK ROCKER MECHANISM

A crank is an arm attached at a right angle to a rotating shaft by which reciprocatingmotion is imparted to or received from the shaft. It is used to convert circular motion into reciprocating motion, or vice versa. The arm may be a bent portion of the shaft, or a separate arm or disk attached to it. Attached to the end of the crank by a pivot is a rod, usually called a connecting rod (conrod). The end of the rod attached to the crank moves in a circular motion, while the other end is usually constrained to move in a linear slidingmotion.

The term often refers to a human-powered crank which is used to manually turn an axle, as in a bicycle crank set or a brace and bit drill. In this case a person's arm or leg serves as the connecting rod, applying reciprocating force to the crank. There is usually a bar perpendicular to the other end of the arm, often with a freely rotatable handle or pedalattached.

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A four-bar linkage, also called a four-bar, is the simplest movable closed-chain linkage. It consists of four bodies, called bars or links, connected in a loop by four joints. Generally, the joints are configured so the links move in parallel planes, and the assembly is called a planar four-bar linkage. Spherical and spatial four-bar linkages also exist and are used in practice. Planar four-bar linkages are constructed from four links connected in a loop by

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four one-degree-of-freedom joints. A joint may be either a revolute, that is a hinged joint, denoted by R, or a prismatic, as sliding joint, denoted by P. A link connected to ground by a hinged joint is usually called a crank. A link connected to ground by a prismatic joint is called a slider. Sliders are sometimes considered to be cranks that have a hinged pivot at an extremely long distance away perpendicular to the travel of the slider. The link that connects two cranks is called a floating link or coupler. A coupler that connects a crank and a slider is often called a connecting rod. The synthesis, or design, of four-bar mechanisms is important when aiming to produce a desired output motion for a specific input motion. In order to minimize cost and maximize efficiency, a designer will choose the simplest mechanism possible to accomplish the desired motion. When selecting a mechanism type to be designed, link lengths must be determined by a process called dimensional synthesis. Dimensional synthesis involves an iterate-and-analyze methodology which in certain circumstances can be an inefficient process; however, in unique scenarios, exact and detailed procedures to design an accurate mechanism may notexist.

In crank-rocker mechanisms the rocker oscillates between two limiting angles (In general, the crank is the input and rocker is the output). The positions of the mechanism when the rocker is at a limit position are called the dead-centre positions of the four-bar.

DESIGN

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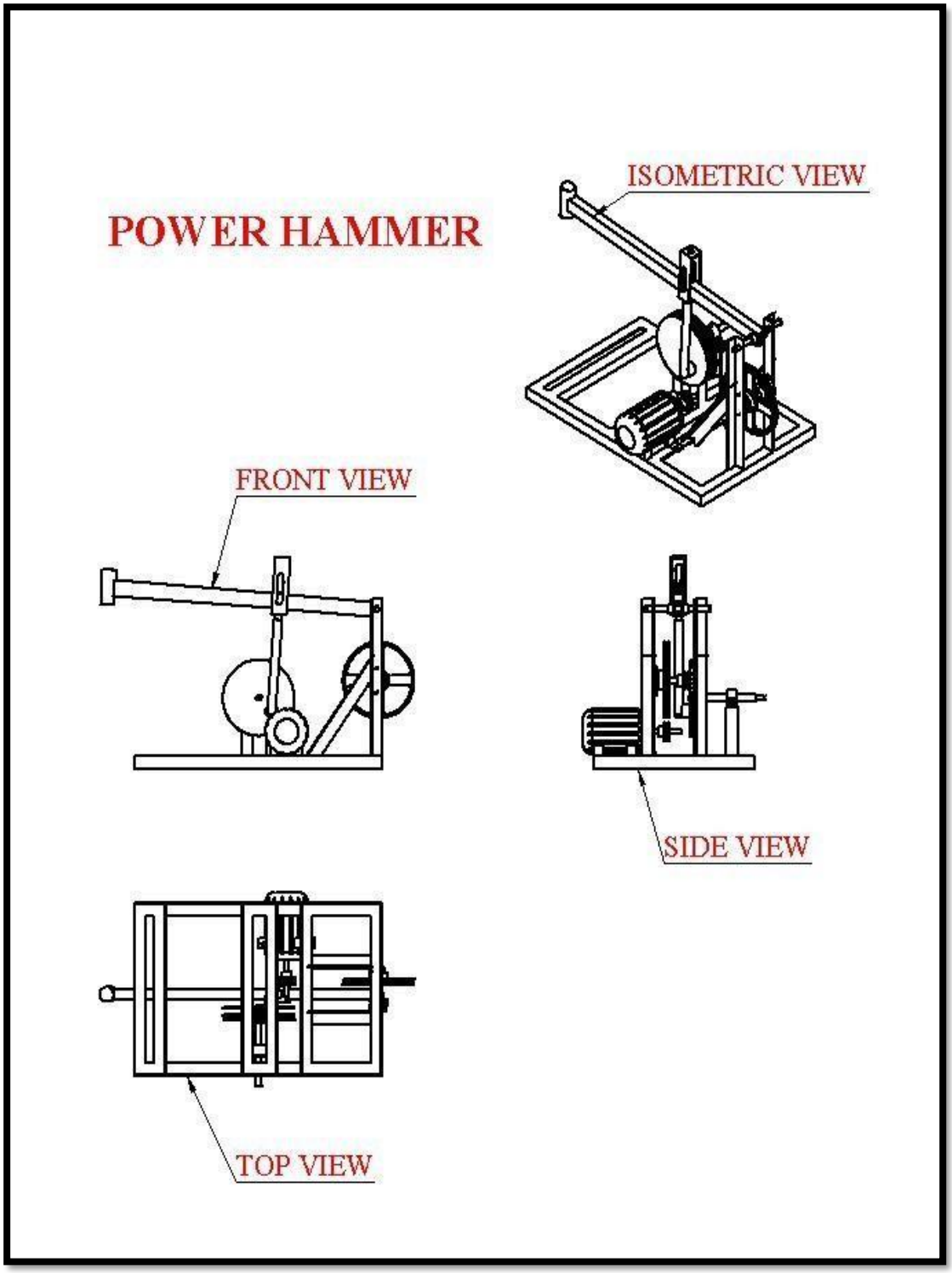

Project model assembly

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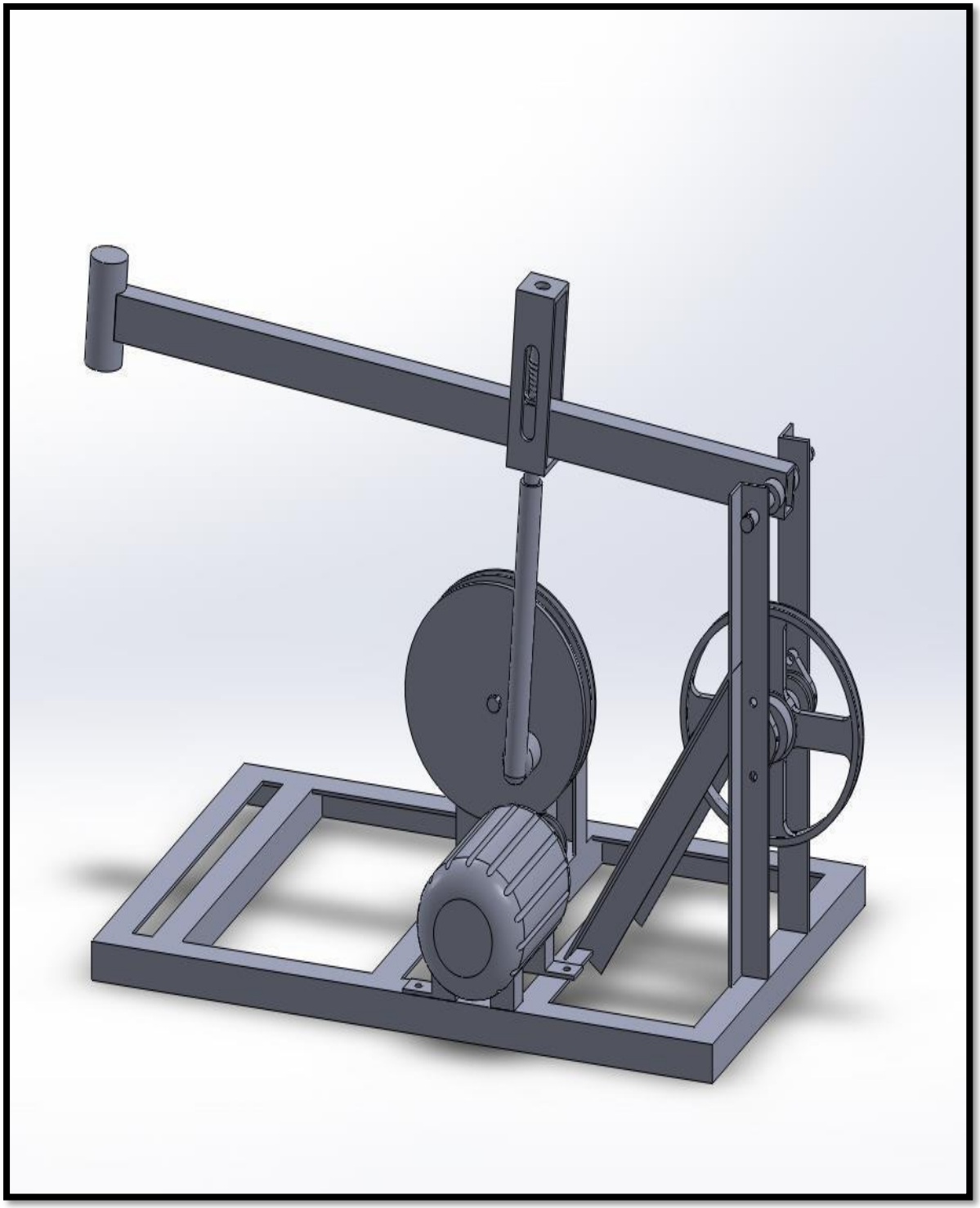

Fig no.6.1 Project model assembly

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CONCLUSION

The project power hammer is later being used in the industry after the completion of the project. The power hammer is being made as per the requirements of the sponsored industry. The power hammer will be used in the industry for forging in the workshop. The main aim is the application of the project for the tool brazing operation as required in the industry. The force required will be calculated as per the requirements.

All these operations are carried out with the metal in a heated condition, which must be maintained by taking a 'fresh' heat when the work shows sign of getting cold. Forging Processes The processes of reducing a metal billet between flat-dies or in a closed impression die to obtain a part of predetermined size and shape are called smith forging and impression-die forging respectively. Depending on the equipment's utilized they are further sub-divided as hand forging, hammer forging, press forging, drop forging, mechanical press forging, upset or machine forging. Press working involves production of final component from sheet metal in cold condition

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