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# Gravity Driven Electricity Generation Mechanism

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**Abstract:-** Sustainable energy generation is major need in the current scenario. Electricity demand is drastically increasing with development and modernization. Power generation using gravitational force is a way to fulfil this demand. Galaxy, stars, planets, asteroids, meteors, etc. are the elements of universe with gravitational force being common in them. This paper explains how energy can be produced using the gravitational force of the earth, without using any external fuel. Sprocket, chain and weights are the mechanical components which provide input for the generation of power. Once the weights are attached at a particular distance, weight of the chain increases on one side than that of other, which in turn rotates the chain sprocket assembly continuously. This assembly is connected to the generator and then to the battery which generates electricity without any interruption.

**Keywords:-** Sustainable energy, external fuel, gravitational force, mechanical components, power generation.

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## I. INTRODUCTION

Electricity is an essential necessity in our day to day lives. It is needed for diverse applications like lighting homes, cooking food, heating water, charging various devices etc. As the population grows so does their demands for electricity. Also, this demand is going to increase with time, modernization and development. The increasing global energy demand and economic growth is severely affecting the electricity supply. Science and technology is advancing from decades but basic electricity has not yet reached to more than 1 billion population in the rural areas and costly fuels like kerosene, diesel, etc. are being used to produce electricity.

Gravitational force being one of the four fundamental forces in the universe, the idea of using it to generate power has been around for some time. To fulfil the overgrowing demand of electricity and eliminate fuel cost, energy can be generated using this force. If energy generation using gravity is implemented, then producing free, clean and continuous electricity is possible. Generation of electrical energy using gravity has advantages, it does not pollute the environment and eliminates the use of fuel for energy generation.

This paper focuses on the use of gravitational force to drive simple mechanical components like chain, sprockets, bearings, weights, etc. which will in turn help in generating electricity. The movement of chain produced in the mechanism due to gravitational force is transferred to a DC generator through transmission system which generates electricity. This generated electricity is stored in a battery for further use. The amount of electricity generated depends on speed of the shaft of the DC generator which in turn depends on the connected weights on the rotating chain. This solution produces electricity without any external fuel input and had wide applications.

The concept of electricity generation using gravitational force is evaluated, divided and organized into six sub-sections. The first subsection is concerned with the literature survey related to the system. The second section explains the construction of the system which generates electricity using gravity and this sub-section is followed by a third section which illustrates the working of this system. The fourth sub-section shows the mathematical calculations and the fifth section discusses the future scope, development and benefits of the system. The sixth section is the conclusion which elucidates the feasibility of the system and the amount of electricity generated.

## II. LITERATURE REVIEW

The phenomenon of gravity was discovered in the year 1687 by sir Issac Newton. A system was designed by Maximo Gomez-Nacer for obtaining electricity by means of the gravity, by using pendulums whose mass and velocity deliver energy for electricity generation.

A gravity power generation mechanism was successfully invented by Chun-chao Wang and Yuh-suiang Wang. The prime objective of this invention was to convert potential energy of the gravity into the kinetic energy uninterruptedly. The mechanism in this concept was simplified and can be used for stable electricity generation.

Martin Riddiford and Jim Reeves have invested four years for developing gravity light. New approach of storing energy and creating illumination was gravity light. After lifting the weight by some distance, it was able to create 30 minutes of light.

Mikhail Dmitriev, a Russian Inventor who made a device which generates electricity by using static gravitational pull. The mechanism he made consists of a wheel with offset weights. The weights were offset in such a way that distance between centre of wheel and weight was more when falling and the distance was less when rising which. This imbalance caused the wheel to rotate continuously.

## III. DESCRIPTION

The need of electricity is increasing at a huge rate and not all regions are receiving the amount of electricity they need. This has forced many people to use alternate sources of energy to generate electricity. But, not all these sources are clean, abundant and freely available.

These systems can be eliminated by use of gravitational force energy generation system. As the name indicates these system uses gravitational force for generation of electricity.
The basic principle on which the system works is that if a body having mass is placed at high altitude then it possesses some amount of energy called as the gravitational potential energy. It is formulated by the product of mass, acceleration due to gravity and height (altitude).
Gravitational Potential Energy = Mass x g x Height

Hence, gravitational potential energy is associated with a mass and position of the body. If such body is dropped, kinetic energy is generated due to gravity. The Speed of this body increases due to gravitational force while potential energy is converted into kinetic energy. Figure 1 shows the arrangement of the system. This system rotates continuously and produces Mechanical Energy which is a sum of Kinetic Energy and Potential Energy. This mechanical energy is further converted into electrical energy with the use of a generator.

$$ME = KE + PE$$
$$= 0.5mv^2 + mgH$$

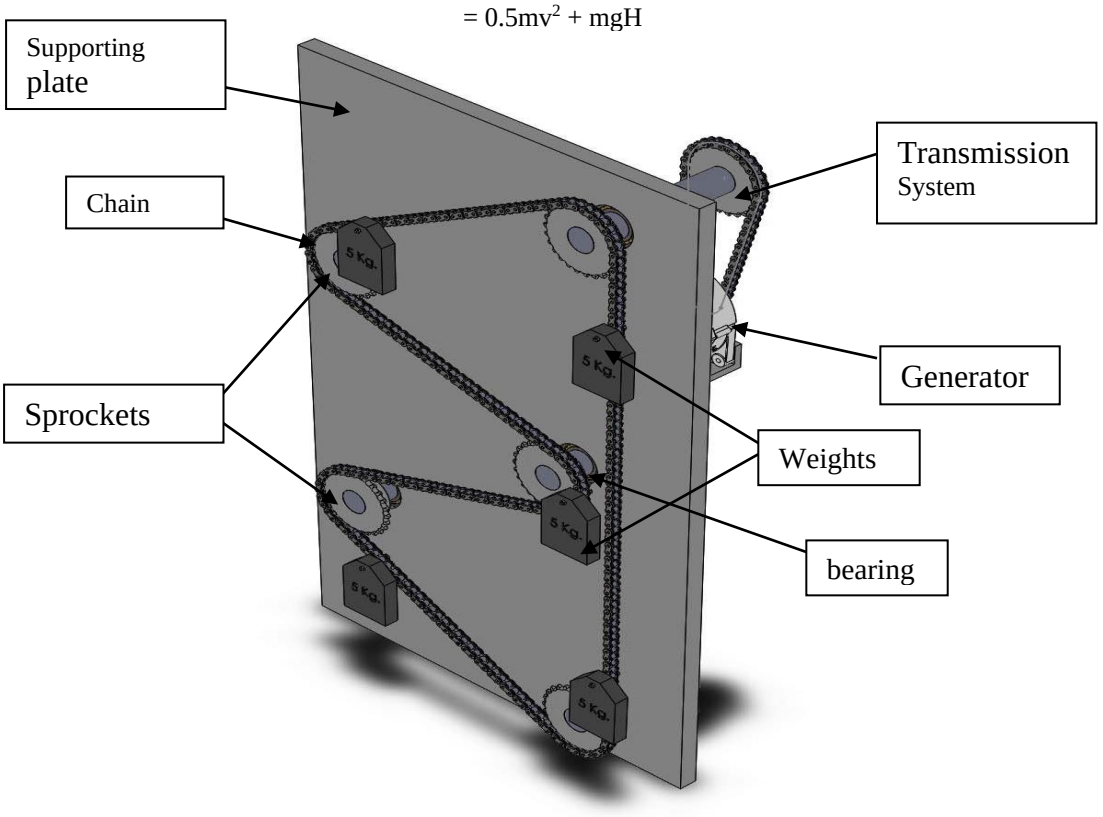


**Fig 1: Design Setup**

A schematic setup of the system is as shown above. It consists of a chain and sprocket assembly, weights, bearings and a supporting plate. The chain used is of 3000mm length and is mounted on 5 sprockets. The position of sprockets is adjusted in such a way that they allow the chain to rotate freely without any disturbances in-between. The sprocket shafts are of 38mm diameter and are press fitted inside the bearings. The bearings used are of standard dimensions of 38mm inner diameter and are mounted inside the supporting plate. Shaft of one of the sprocket is connected to generator through transmission system. The transmission system used may be chain driven or gear driven which transmit the motion of sprocket to the generator. A 300-watt 12v 300rpm generator is used which is suitable to charge a 12v battery effectively. 5 Weights of equal mass are attached to the chain by replacing the chain pin with a nut and bolt as shown in figure. These weights have equal spacing of 600mm in between them. The imbalance produced due to these weights gives motion to the chain drive assembly.

## IV. WORKING

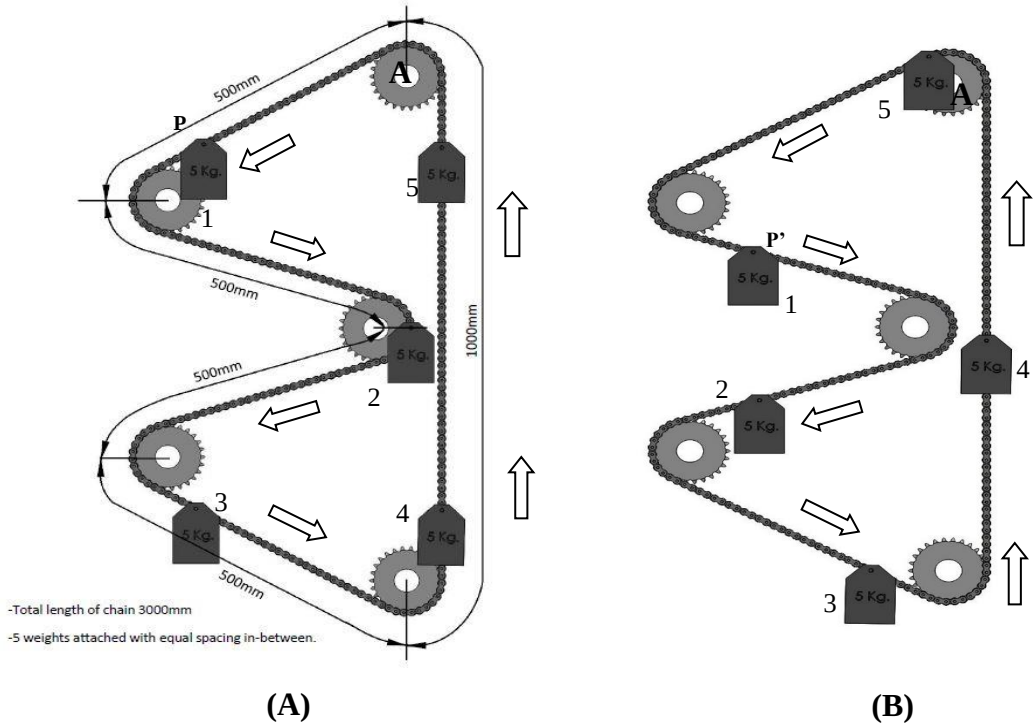


**Fig 2: Working**

The principle on which this device works is when an object with a mass is placed at a higher altitude then the gravitational force will pull it to a lower altitude while it gains kinetic energy. This kinetic can be further converted into mechanical energy and then electrical energy.

Figure 2 illustrates the working of this system. The total length of chain is 3000mm and the generator is connected to sprocket A. The sprockets are arranged in such a way that 1/3 length i.e. 1000mm portion of chain is on the right side of the assembly and the remaining 2/3 length i.e. 2000mm portion of the chain is engaged on the left side as shown in the fig. 2(A). As weights are odd in number and are equally spaced there will always be one weight more on left side. Thus, self-weight of chain and the additional weights attached causes more weight on left side than on the right.

If we consider that weight 1 is at point P as shown in fig. 2(A), the imbalance caused by this weight 1 will shift the point P downwards to point P' as is shown in fig. 2(B). This movement of the weight leads to the movement of chain and further the movement of other weights. As the chain length is kept double on the left side, thus the amount of weight on left side of chain will always be greater than right side. These imbalanced weights cause chain to rotate which in turn generates ample amount of torque to rotate the generator which is connected to sprocket A.

## V. CALCULATIONS

**Torque calculations:**

As generator is connected to sprocket A as the maximum torque is generated at sprocket A,

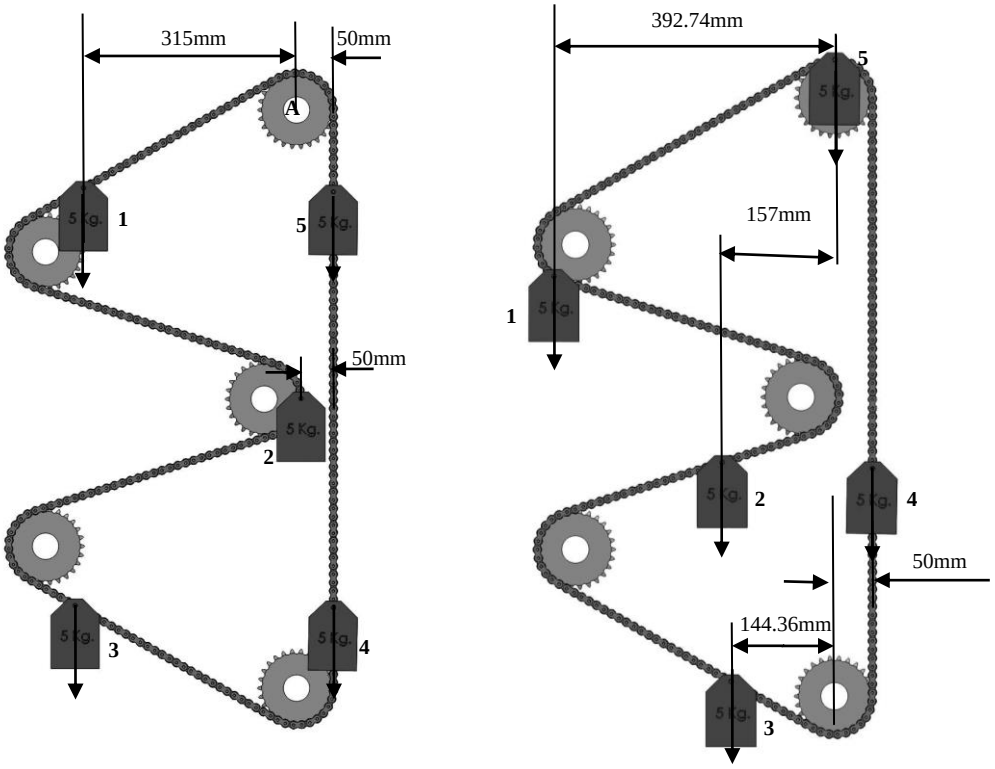


**Fig 3: Torque calculations**

For position as shown in fig 3(A), calculation for torque is as shown below-

MA = $(5 \times 315)_1 + (5 \times 0)_2 + (5 \times 315)_3 - (5 \times 50)_4 - (5 \times 50)_5$ … ( +ve)

= 1575 + 0 + 1575 – 250 – 250

= 2650 Kg-mm

= 2650 x 9.81 x 10-3 N-m

= 25.9965 N-m

For fig 3(A) calculation for torque is shown below-

MA = $(5 \times 392.74)_1 + (5 \times 157)_2 + (5 \times 144.36)_3 - (5 \times 50)_4 + (5 \times 0)_5$ … ( +ve)

= 1963.7 + 785 + 721.8 – 250 + 0

= 3220.5 Kg-mm

= 3220.5 x 9.81 x 10-3 N-m

= 31.5931 N-m

As torque at sprocket A is always positive it will rotate contineously.

## VI. FUTURE SCOPE

As the global demand for electricity is increasing it is important that alternative methods and systems are developed to fulfil this demand. Also, there is a need of such a system that can generate electricity anywhere freely and in a clean way. Thus, this system will help to produce electricity without the use of any type of fuel.

It is seen that a chain transmission system used to connect the sprocket shaft to the generator shaft. Instead of a chain transmission system a gear transmission system can be used.

As mentioned in the description a 300-watt 12v 300rpm generator is used which is able to charge a 12v battery easily. Thus, this system can be used to charge automobile batteries or can be used to run street lights. Also, if a generator of larger capacity is required it can be connected to the system instead of the generator mentioned in the description after modifying the transmission system.

## VII. CONCLUSIONS

It is seen that if this electricity generation system is used it will produce a torque of 31.5931N-m which can be used to run a 300-watt 12v 300rpm generator. It is also observed that only 0.3 N-m of torque is used to run this generator so a generator of higher capacity can also be used to charge a battery. The system is environment-friendly, requires no fuel, low in cost, simple in design and can provide a stable energy output for long-term use.

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