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FABRICATION OF SEE-SAW OPERATED WATER PUMP

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Abstract - The present invention is to provide a water pump using a seesaw to lift the underground water to the outside by the power to enjoy the seesaw play without the motor pump. To this end, the present invention, a manual water pump, a body portion having a first flow path pipe connected to the first outlet, the second flow path pipe connected to the second outlet, the lower flow pipe connected to the water source underground; An average bar fastened to a central hinge part of the body part and having a scaffolding part formed at one end of both sides thereof; The scaffolding unit moves up and down in accordance with the seesaw movement of the user; And a piston formed integrally with the lower end of the average bed and including a piston located inside the lower passage tube.The researchers employed the mechanical motion of a playground seesaw to induce pumping activity. The research's goal was to make a low-cost prototype energy device out of a playground seesaw and recycled materials. Water can be pumped from a bore well, a sump, or a rainwater collection tank. It uses the collective energy of the children or the operators to pump water. See-saw pumps use force lift technology to transport water from a well to an overhead tank above ground level for storage and distribution. It does not require the use of electricity to function. In See-Saw pumps, which are based on the same principle, the reciprocating action is employed to move the valves of a water cylinder. The technology is listed below. Because of technological advancements it is relatively easy to maintain at the village level because the technology beneath the earth is equivalent to that of a hand pump.

Key Words: : See-Saw, Water Pump

1.INTRODUCTION

Hand water pump with a pendulum is a very simple solution for pumping water. It provides alleviation of work, because it is enough to move the pendulum occasionally with a little finger to pump the water, instead of large swings. Work is alleviated because easier, long-lasting and effortless use of the hand water pump has been enabled. Once input is provided to pendulum, it keeps on oscillating for some time, thus transferring the oscillatory energy into reciprocating motion. The attraction of the mechanism was the amount of energy input provided to be less than the energy output. The statement was explained by carrying out various kinds of experiments. The hand pumps are manually operated pumps, they use human power and mechanical advantage to move fluids or air from one place to another. There are many different types of hand pump available, mainly operating on a piston, diaphragm or rotary vane principle with a check valve on the entry and exit ports to the chamber operating in opposite directions. Most of the hand pumps have plungers or reciprocating pistons, and are positive displacement. Thus by considering all conventional advantages we decided to use water operated pump with more efficient working which can be used in various purpose. Earlier pumps which are run on the electricity, that are not used in places where electricity is not available. Also they have high cost and high maintenance cost. Operating cost of such pumps is also high. To solve this problem we want to develop new gravity assisted free energy pump by using two springs and two masses system, which runs without electricity. Gravity assisted free energy pump system is an innovative method that utilizes the concept of Free un-damped vibrations in two mass two spring system. The gravity assisted free energy pump is operate manually and should have low initial and operating cost. Many methods of alternative energy generation have been invented and devised; one such method is discussed in this document and is direct application of energy to pumping [1-3]. Gravity assisted free energy pump system is an innovative method that utilizes the concept of 'Free un-damped vibrations in two mass two spring system, i.e. effective use of vibrations to form an industrial application. The following are the objectives which were considered:

• To use new source of energy i.e. Alternative energy, where problem of electricity is occurring.

• To improve the efficiency of pump by using spring and mass system with minimum input gives maximum output.

• To run the reciprocating pump by using vibration of masses.

• To create a device which is runs by man efforts & which is used for small scale farming.

• To develop pump which have low operating and which require minimum space.

The innovation of see saw pumps lies in the fact that it makes the mundane process of pumping water fun. It is suitable for use on 100mm and above diameter bore well, sump or rainwater collector tank and can lift water up to 8m above ground for storage and distribution [4]. Easy to install and safe to use, these pumps have low operation and maintenance cost and can be adopted with below ground assembly of any deep well hand pump even in remote areas. The see saw pumps have a wide range of applications in the following settings:

- Schools, for drinking, sanitation and personal hygiene. - Institutions for drinking and sanitation.

- Public garden, drinking, sanitation and watering plants.

- Community centers for drinking and sanitation.
- Small communities for drinking.
- Relief camps for drinking.

2. LITERATURE REVIEW

In the past, research was conducted in order to resolve the issues. This is a review of the design of a small-scale functioning model of a See Saw Operated Pump that includes all of the see saw pump functions and features. According to V.P. SINGH's research, the Bush pump can be simply produced locally, with the parts changing to what the local community has on hand. The bush pump has grown into the world's most durable and widely used locally produced hand pump. A piston-driven down hole cylinder is the basis of the Bush pump. It's referred to as a "positive displacement pump" since it moves the same amount of water as the piston does. Using the rowing pump, water is pumped through a tube into an above-ground container with the use of a push and pull handle.. Euro Inox is a market-development organization for stainless steel in Europe.
1) The chemical make-up of stainless steels
2) Features of the body Mechanical properties of stainless steel, no. 2
3) Physical Properties of Stainless Steel

[1] The authors of this paper are L.A. Kristoferson and V. Bokalders. Over decades, the progression of significant successes in water lifting devices is demonstrated and disputed, with a focus on major technology. There are various fascinating facts about ancient water lifting technologies, including its apparent longevity, versatility, and long-term viability. Various early civilizations' technological achievements are compared.. Modern water engineering success is built on these technologies. They're a great illustration of looking back and forward at the same time. During the last 5500 years of human history, a chronology of the global evolution of water pumps is displayed. The data is organised chronologically, with a focus on the world's main civilizations. [2]This work was written by G. Antoniou and G. Lyberatos. Sanitation and hygiene technologies have existed in ancient Hellas since the Bronze Age (ca. 3200–1100 BC), when vast sewerage and drainage systems, as well as other intricate sanitary constructions, were known in Minoan palaces and towns. The pressure of expanding populations forced the construction of communal restrooms with more tightly packed seats as cities grew in size. Drainage and sewerage systems, as well as sanitary infrastructure, are culturally and technologically advanced, and they are linked to current hygiene and medical observations and ideas. Prior to the Hellenic breakthroughs, medicine was completely confined to religious beliefs and metaphysical rituals.. Throughout the early Roman period, the ancient world's understanding of sanitary issues was incorporated into legislative rules. Despite the weakening of this legislation over time, sanitary procedures were adhered to, even if a mason's technical tradition required it. Various rulers of the Hellenic realm later extended their sanitary practises to the wider Helladic realm [3] In playgrounds and public areas, S.R. Pandian suggests a method for harvesting human power based on children's play on seesaws, merry-go-rounds, and swings. When a large number of children play in a playground together, some of the energy they generate can be successfully harnessed, resulting in massive energy storage. This stored energy can then be converted to electricity and utilised to operate low-power equipment such as lights, fans, and communication devices. The method produces electricity at a low cost and with few resources, making it perfect for developing countries.. This publication discusses the concept underlying the technique. To demonstrate the practical utility of the recommended technology, the results of research on a laboratory prototype compressed air human power conversion system using a teeter-totter are demonstrated. [4]

3. METHODOLOGY

Designing and implementing a see-saw hand pump involves a systematic methodology that considers various factors such as local conditions, materials availability, community involvement, and pump efficiency. Below is a comprehensive methodology for developing a see-saw hand pump:

1. Needs Assessment and Site Selection:
Conduct a thorough assessment of the water needs and existing infrastructure in the target community.bIdentify suitable sites for installing the hand pump, considering factors such as proximity to water sources, community accessibility, and geological conditions.

2. Community Engagement:
Engage with local community members, leaders, and stakeholders to understand their water requirements, preferences, and cultural considerations Involve the community in the decision-making process, seeking their input on the design and implementation of the hand pump.

3. Research and Design:
Research existing see-saw hand pump designs and adapt them to suit the specific needs and conditions of the target community. Design the pump mechanism, taking into account factors such as ease of operation, mechanical efficiency, and durability.
Ensure that the design uses locally available materials to minimize costs and maximize sustainability.

4. Prototype Development:
Build a prototype of the hand pump based on the finalized design. Test the prototype under controlled conditions to evaluate its performance, efficiency, and reliability. Gather feedback from community members and stakeholders to identify any necessary modifications or improvements.

5. Material Sourcing and Preparation:
Source the necessary materials for constructing the hand pump, prioritizing locally available and affordable options. Prepare the materials by cutting, shaping, and assembling them according to the pump design specifications.

6. Construction and Installation:
Mobilize a team of skilled workers and community volunteers to construct the hand pump. Follow the construction plan and guidelines meticulously to ensure the pump is assembled correctly and securely. Install the hand pump at the selected site, ensuring proper alignment and anchoring to the ground.

7. Training and Capacity Building:
Provide comprehensive training to community members on how to operate, maintain, and repair the hand pump. Empower local technicians or caretakers to take responsibility for the ongoing maintenance and servicing of the pump. Conduct regular refresher training sessions to reinforce skills and knowledge retention.

8. Monitoring and Evaluation:
Establish a monitoring and evaluation framework to assess the performance and impact of the hand pump. Monitor the functionality, water yield, and user satisfaction with the pump over time. Evaluate the socio-economic and health outcomes associated with improved water access. Use feedback and data collected to make informed decisions about maintenance, repairs, and future interventions.
9. Maintenance and Sustainability:
Implement a maintenance schedule to ensure the hand pump remains in good working condition. Encourage community ownership and participation in maintaining the pump, fostering a sense of responsibility and accountability. Explore opportunities for income generation or cost recovery mechanisms to sustain the long-term operation and maintenance of the hand pump

4. WORKING OF SEE SAW PUMP

The concepts behind this see saw pump is to lift the water with the help of pendulum, which is attached to the fulcrum. The pump used in this prototype converts the oscillatory motion into the reciprocating motion, and henceforth lifts up the water up to the desired level. The pump is made of pendulum, and cylinder with the piston which pumps the water. Oscillation of the pendulum is maintained by periodical action of the human arm as shown in Fig.1. Oscillation period of the pendulum is twice bigger than the period of the lever oscillation. Piston of the pump has reverse effect on the lever and damps its oscillation. Equilibrium position of the lever is horizontal, and the equilibrium position of the pendulum is vertical. Oscillation of the lever and the pendulum takes place in the same plane, vertical in reference to the ground [5]

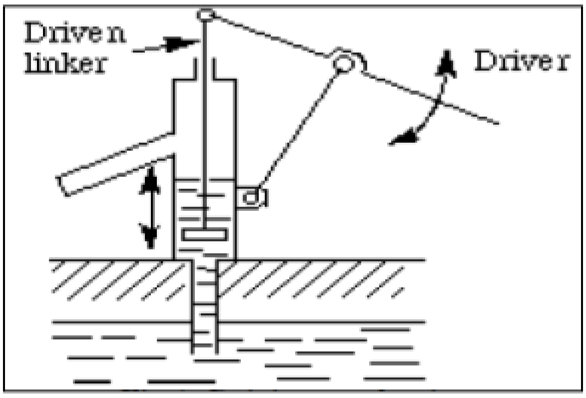


Fig. 1. Driving mechanism.

The gravity effect can be created by using rotation and inertia. In this, the pendulum represents the gravity shield, such that its energy varies from horizontal to vertical axis. The work done by total vertical force acting at pivot point of the pendulum when the pendulum is at vertical axis is passed to the left side of the lever and this work is used to increase potential energy of mass on the other side of the lever as it goes in upward direction. As the pendulum is attached to the fulcrum perpendicularly, its oscillating motion is converted into the reciprocating motion of fulcrum. Later, this reciprocating motion of fulcrum is damped by springs, which are attached to the base and fulcrum. This damping motion of springs provides reciprocating motion to the pump and hence lifts up the water as shown in Fig. 2 [6]. Fig. 2. Working of see saw pump. The main advantage of hand water pump is to avoid human strain. It also helps us for the easy way for pumping water. The cost required to implement this is comparatively low Hand water pump with is more efficient when compared to normal hand water pump as the water flow is high. The main advantage of this pump is that they are one of most economical and simple solution for providing collective

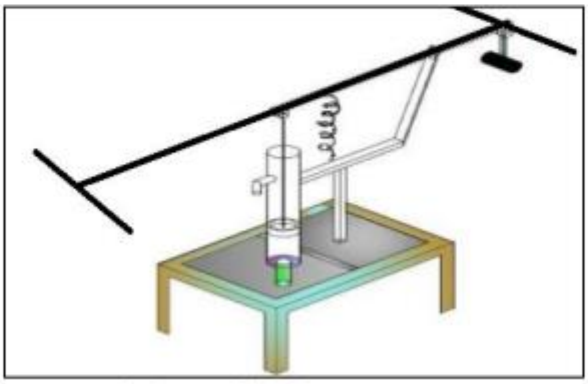


Fig. 2. Working of see saw pump.

supply of drinking water. The main limitation is the reciprocating pump initially needs priming so it lifts water at desired level. As the design is simple the links are simple and long hence system becomes bulky. A pump requires regular maintenance which must be carried out if pump is to be use on a sustainable basis. Water pump with pendulum can be widely used in rural areas. As the installation cost of water pump with pendulum is low it is useful for poor people. It can be installed in all the public places. It can be operated by children or old people as the force required by the pump is low. The technical specifications of see saw pump given below table 1 [7-9].

5. TECHNICAL SPECIFICATIONS FOR A SEE-SAW PUMP

Technical specifications for a see-saw pump can vary based on factors such as design, materials, and intended usage. Here are some typical technical specifications for a basic see-saw hand pump:

1. Dimensions and Weight:
Overall Dimensions: Typically, a see-saw hand pump may have dimensions of approximately 2 to 3 meters in length, 1 to 1.5 meters in height, and 0.5 to 1 meter in width.
Weight: The weight of the pump can vary depending on materials used, but it is usually designed to be lightweight enough for easy operation by users of different ages and strengths.
2. Materials:
Main Structure: The main structure of the pump is often constructed from durable and weather-resistant materials such as steel, aluminum, or sturdy wood.
Piston/Plunger: The piston or plunger, which creates suction to draw water, is typically made of corrosion-resistant materials like stainless steel or durable plastics.
Seals and Valves: Seals and valves are often made from rubber or other flexible materials to ensure watertight operation.
3. Pump Mechanism:
Lever Arm: The lever arm is the key component of the pump mechanism, typically made of sturdy metal or wood. It pivots around a fulcrum to facilitate pumping action.
Fulcrum: The fulcrum provides the pivot point for the lever arm and is securely anchored to the ground.

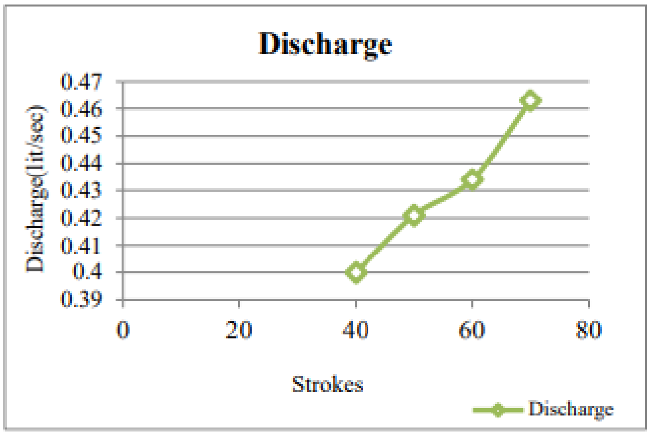
Handle: The handle at one end of the lever arm is designed for easy gripping and manipulation by the user.
Plunger/Piston Assembly: The plunger or piston assembly moves up and down inside a cylinder to create suction and draw water from the source.

4. Pumping Capacity:
Water Output: The pumping capacity of a see-saw hand pump can vary depending on factors such as the size of the piston/plunger, stroke length, and user effort. Typically, it can deliver several liters of water per minute.
Depth: See-saw pumps are generally suitable for water sources up to a certain depth, which can vary depending on the design and configuration of the pump.
5. Operation:
Ease of Use: See-saw pumps are designed to be user-friendly, requiring minimal effort to operate. The see-saw motion allows users to pump water with a rhythmic up-and-down movement.
Maintenance: The pump should be designed for easy maintenance, with accessible components that can be inspected, lubricated, and replaced as needed.
6. Durability and Longevity:
Weather Resistance: The pump should be designed to withstand exposure to outdoor elements such as sunlight, rain, and temperature fluctuations.
Corrosion Resistance: Materials should be chosen to resist corrosion and deterioration over time, especially if the pump will be used in areas with high humidity or saline water.
Longevity: A well-built see-saw pump can have a long service life, especially if it is properly maintained and serviced at regular intervals.
7. Installation Requirements:
Foundation: The pump should be installed on a stable and level foundation to ensure proper operation and prevent damage.
Anchoring: Anchoring mechanisms may be required to secure the pump to the ground and prevent displacement during use.
8. Safety Considerations:
User Safety: The pump should be designed with safety features to prevent accidents or injuries during operation, especially for children or inexperienced users.
Water Quality: Measures should be taken to ensure that the water drawn by the pump is safe for consumption, including regular testing and maintenance of the water source.
9. Compliance and Standards:
Regulatory Compliance: The pump design and installation should comply with relevant local regulations and standards for water supply infrastructure and public health.
Quality Assurance: Quality control measures should be implemented during manufacturing and installation to ensure that the pump meets specified performance and safety standards.

Sr. No.	Construction details	Specifications
1	Wing span	3 meter
2	Play mechanism	See saw
3	Capacity	8-16 children
4	Ideal speed	40 strokes per minute
5	Output	1500-2000 liters per hour
6	Space requirement	6 m × 1.5 meter minimum
7	Operating depth	Up to 80 meter depth
8	Cylinder	Direct action reciprocating of cylinder of any deep well hand pump
9	Delivery head	8 meter
10	Weight	600 kgs.
11	Construction material	Fabricated mild steel
12	Riser pipes	As per requirements

6. RESULT
The many parameters that govern the see-saw pump's output discharge are examined, and the results are plotted.
Stroke length of the pump (L) = 0.457 m
Diameter of connecting rod = 0.0127 m
Diameter of piston (D) = 0.05 m
Time Period (Tp) = 1.5 s
SPEED OF THE PUMP:
N = 60/Tp
N = 60/1.5
N = 40 strokes/min

Sr. No.	No. of Stroke	Discharge in (Litres/Sec)
1	40	0.4
2	50	0.421
3	60	0.434
4	70	0.463



7. CONCLUSION
In upcoming days the demand of energy resources will be increasing every day's the aim of this project is to develop the world by enriching by utilizing its resources more. Now time has come for using such innovative ideas and it should brought into practice. In this project the mechanism is used to lift the water from one place to another with reciprocating pump. This project is completely based on "simple pendulum". There are many sources to convert from

mechanical energy to various forms. In this system no fuel or electrical energy is used. This project gives the overview for the challenges and opportunities for energy lasting in coming decades, this work can make best use of existing technology to ensure reliability and efficiency under changing condition. It outlines the need for cost effective technology in rural region. It is very useful not only in the hilly area where electricity is not available but also it is best option for farmer which are economically backward and those people who want the pump which is free from electricity. From the trials it was concluded that the water can be lifted with the less effort and human can easily operated After completing our project's testing, we received positive results. We achieve the majority of the objectives and goals we set for ourselves at the beginning of our project. We were able to cut down on manpower. There is no need for energy, which lowers the overall cost of implementation. This pump may be operated by anyone and can lift 400ml of water in one cycle. The studies revealed that the water can be raised with little effort and that humans can operate it effortlessly

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