KEYS OF UNDERSTANDING GRAVITY MACHINES OF VELJKO MILKOVIC

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ABSTRACT

The goal of this work is of to clarify some issues concerning two inventions of Serbian inventor Veljko Milkovic. The first invention is two-stage mechanical oscillator and second one is inertial propulsion cart. Analysis is based on works of Jovan Bebic, Ljubo Panic, Colin Gauld and other works found on the inventor's site www.veljkomilkovic.com.

Claim that two-stage mechanical oscillator creates free energy using gravity energy as perpetuum mobile raised a lot of discussion questions and suspicions. Several scientists also devoted some time to create mathematical models and analyze it. I had a chance to see one such work by well known scientist sent to a person on the site as reply to his work. He used well known Lagrangian technique to analyze total energy (kinetic and potential) of the whole system and found no accumulation of total energy in the time. However, I was able to find two problems in the model. First problem could be easy noticed by a person who actually saw oscillator working and second problem I noticed after I tried to build mechanical feedback loop and failed in my first attempt.

In this work I will try to:

- point out omissions in modeling the system,
- discuss issues with mechanical feedback loop,
- discuss some errors in measuring and re-calculate output energy done by Jovan Bebic,
- continue addressing issues started by Colin Gauld concerning Centrifugal force terminology and omission to use moment of inertia in formula for kinetic energy,
- explain errors in Lead Out theory developed by Lee Cheung Kin and Lawrence Tseung,
- challenge the first and third Newton's laws and confine the law of conservation of quantity of the movement of the system in analysis of inertial propulsion cart.

Key words: Gravity machines, Pendulum, Oscillator, Lead Out, Inertial Propulsion, Newton's laws

INTRODUCTION

Well known fact from the mechanics is that energy in pendulum will swing between potential and kinetic energy. Once potential energy reach its maximum kinetic energy would come to zero as velocity become zero in two extreme points, one on the right and second on the left side. Kinetic energy will have its maximum when potential energy has its minimum and it is in vertical low position of the pendulum. Here velocity is also in the maximum.

Another fact from the physics is that any body which moves along curved path has acceleration and if body has acceleration it means that a force acts upon it. The force which caused body to curve is puling inside and was named as Centripetal force. It could be any force in nature as gravitational force which caused rotation of the planets around the Sun or electrostatic force which keeps orbiting electrons around the core of atom. In the case of the pendulum that force is inside the handle and is named Reaction force. Weight of the pendulum bob and Reaction force in the pendulum handle are only real forces in the pendulum system if pendulum pivot was fixed.

According to the Newton third law which says that every action has its reaction in opposite direction and the same intensity, the force opposite to Centripetal force which prevents curving indefinitely and falling into a center is named Centrifugal force. These two forces are in the balance if body moves harmoniously like moving along the circle.

However, Centrifugal force is not real force and doesn't go into formulas in inertial frame. Only above mentioned two forces are taken into formulas. Centrifugal force is fictitious force and often mistakenly thought to cause a body to fly out of its circular path when it is released; rather, it is the removal of the centripetal force that allows the body to travel in a straight line as required by Newton's first law. Another example would be a passenger bumping against right door in the car turning to the left. He would blame Centrifugal force for it, but real cause of the problem would be the turning car as Centripetal force which prevented passenger's inertial mass to continue to move in the straight line.

THEORY OF PENDULUM

Mathematical Pendulum

In this model only real forces are taken into calculations. In the Fig. 1 can be seen two forces: Weight F_g and reaction in the handle T. Summary force R is displayed as broken into two components: Normal N and tangential Ft, see Fig. 2.

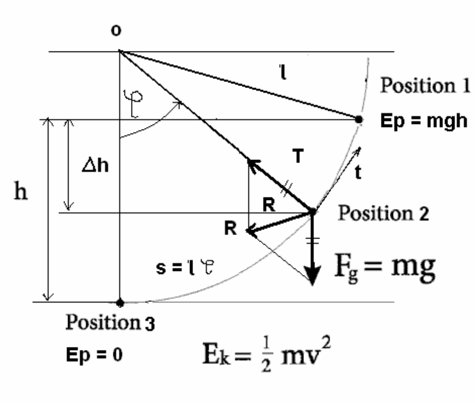


Fig. 1

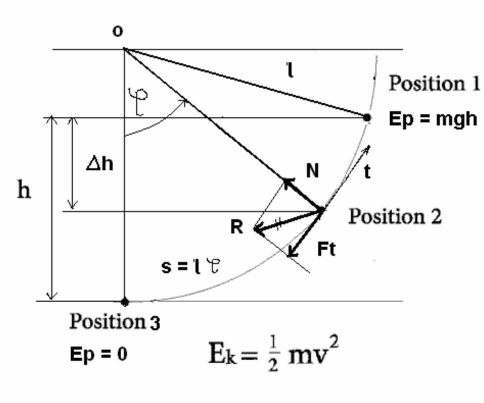


Fig. 2

The goal of mathematics here is to find reaction force *T*. The same force but with opposite direction is acting on pivot *O*. The best way to do this is to use natural coordinate system where one axis is tangent ***t*** and second coordinate is normal to ***t*** and in the pendulum handle with direction towards pivot. The reason for this is because formula for normal acceleration is already known from kinematics:

$$a_n = v_t^2 / l \tag{1}$$

where v_t is tangential velocity. From Newton's second law it is known that

$$N = m\, a_n \tag{2}$$

and it comes that normal force has value

$$N = m\, v_t^2 / l \tag{3}$$

Also from Newton's second law it is known

$$F_t = m\, a_t \tag{4}$$

where a_t is tangential acceleration.

Upon projection of all forces from Fig. 1 on coordinates from Fig. 2 it comes

$$F_t = -\, mg \sin(\varphi) \tag{5}$$

$$N = T - mg \cos(\varphi) \tag{6}$$

From (3) and (6) it comes

$$T = m\, v_t^2 / l + mg \cos(\varphi) \tag{7}$$

Potential energy in position 1 is

$$E_p = mgh = mgl\,(1 - \cos(\varphi_o)) \tag{8}$$

where φ_o is staring angle of the pendulum in position 1.

Potential energy spent from position 1 to position 2

$$\Delta E_p = mg\Delta h = mg\, l(\cos(\varphi) - \cos(\varphi_o)) \tag{9}$$

turns into kinetic energy:

$$E_k = \tfrac{1}{2} m v_t^2 \tag{10}$$

from (9) and (10) it comes:

$$\tfrac{1}{2} m v_t^2 = mg\, l(\cos(\varphi) - \cos(\varphi_o)) \tag{11}$$

and from (11) tangential velocity squared:

$$v_t^2 = 2g\, l\, (\cos(\varphi) - \cos(\varphi_o)) \tag{12}$$

Changing (12) into (7) it comes:

$$T = mg\, (3\cos(\varphi) - 2\cos(\varphi_o)) \tag{13}$$

Changing (12) into (3) it comes:

$$N = 2mg\,(\cos(\varphi) - \cos(\varphi_0)) \tag{14}$$

Intensity of resultant force exerted on the bob can be found from:

$$R^2 = N^2 + F_t^2 \tag{15}$$

From (4) and (5) it comes

$$ma_t = -\,mg \sin(\varphi) \tag{16}$$

$$ma_t + mg \sin(\varphi) = 0 \tag{17}$$

From mathematics it is well known that arc *s* equals to:

$$s = l\ \varphi \tag{18}$$

and by derivation of (18) by time we have formula for *s′* which is identical to v_t

$$s' = l\ \varphi' \tag{19}$$

second derivation of arc *s* by time gives tangent acceleration *s″* which is identical to a_t.

$$s'' = l\,\varphi'' \tag{20}$$

Changing (20) into (17) gives differential equation of second degree:

$$ml\,\varphi'' + mg\ \sin(\varphi) = 0 \tag{21}$$

$$\varphi'' + g / l \sin(\varphi) = 0 \tag{22}$$

Above differential equation can not be solved using elementary functions, but for small angles of oscillation it can be taken that:

$$\sin(\varphi) = \varphi \tag{23}$$

Changing (23) into (22) it comes as

$$\varphi'' + \omega^2 \varphi = 0 \tag{24}$$

where

$$\omega^2 = g / l \tag{25}$$

Solution of equation (24) is

$$\varphi = \varphi_0 \sin(\omega t) \tag{26}$$

where φ_0 is starting angle of pendulum. Period for small oscillations is given as:

$$P = 2\pi / \omega = 2\pi \sqrt{(l / g)} \tag{27}$$

For period of any oscillation differential equation (12) must be solved. Approximate result:

$$P = 2\pi \sqrt{(l / g)}\,(1 + ¼ \sin^2(\varphi_0)) \tag{28}$$

Physical Pendulum

In analysis of mathematical pendulum it was assumed that all mass was concentrated in single dot. However, real pendulum have radius of the bob and all dots in it have different distance from the pivot. The result is that for the same angular speed ω all dots of the bob mass have different tangential speed. Only dot in the center of the bob has the speed:

$$v_t = l\,\omega \qquad (29)$$

Equation (29) is identical to the equation (19).

To find kinetic energy of the bob mass, velocity of all points should be calculated. To speed process up a variable *J* called moment of inertia is calculated. It depends of the geometry of the bob. Down are moments of inertia for cylinder and a ball.

$$J_C = \tfrac{1}{2}\,m\,r^2 \text{ for cylinder which rotates around its center} \qquad (30)$$

$$J_C = {}^{2}/_{5}\,m\,r^2 \text{ for ball which rotates around its center} \qquad (31)$$

where *r* is the radius of the body from its center to the periphery.

For a bob which rotate around the point *O* outside its center, moment of inertia is:

$$J_O = J_C + ml^2 \qquad (32)$$

where J_C is the moment of inertia for the center of the body as in (30) and (31).

However if the handle of the pendulum is long, for example $l = 5r$, then for cylinder it comes that value $ml^2 = 50J_C$ and J_C can be disregarded with 2% error. Then for cylinder:

$$J_O = ml^2 \qquad (33)$$

Formula for kinetic energy for pendulum bob from Fig. 3 then becomes:

$$E_K = \tfrac{1}{2}\,J_O\,\omega^2 = \tfrac{1}{2}\,m\,l^2\,\omega^2 \qquad (34)$$

By changing (29) into (34) above formula will be the same as formula (10).

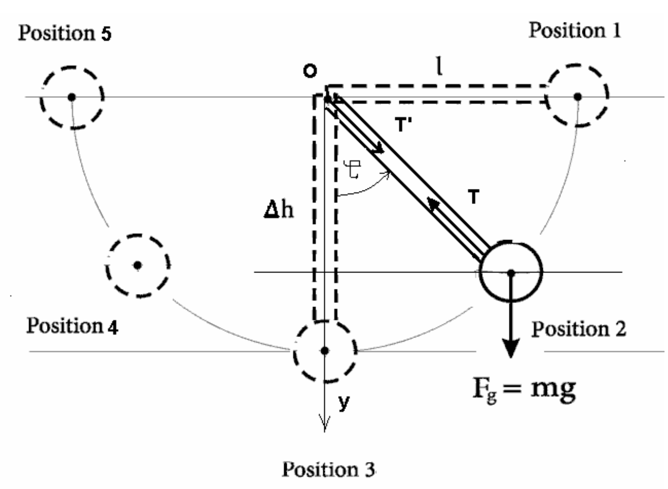


Fig. 3

Differential equation for physical pendulum is using moment of the forces like:

$$J_o \varphi'' = - mg\, l \sin(\varphi) \tag{35}$$

$$\varphi'' + mg\, l / J_o \sin(\varphi) = 0 \tag{36}$$

$$\varphi'' + \omega^2 \sin(\varphi) = 0 \tag{37}$$

This equation is similar to (22) and solution for small angles is the same as (26). Period for small oscillations is similar to (27) and for any oscillation is similar to (28). Only difference is formula for angular frequency ω.

$$\omega^2 = mgl / J_o \tag{38}$$

For pendulum with long handle and cylindric bob using (33):

$$\omega^2 = mgl / ml^2 = g / l \tag{39}$$

This formula is the same as formula (25) for mathematical pendulum.

Conclusion is that for pendulums with long handle all mathematics for mathematical pendulum can be applied with small errors not greater than 2%.

TWO-STAGE MECHANICAL OSCILLATOR

Useful work from the gravitational force can not be obtained more than once. Once potential energy of the mass is turned into kinetic it can be spent for some useful work or turned back into potential energy again. To allow pendulum to continue swinging its kinetic energy must be left to turn into potential energy again. So, how any useful work can be obtained from gravity energy then? If it was possible to turn gravity off after all potential energy was spent and then move mass up again and then turn gravity on, perpetuum mobile would be created. However, nobody was able to turn gravity off yet, but it is well known fact that artificial gravity effects can be created by using rotation and inertia of the system. This is used in space stations. Some of these effects can be found in gravity converter machine constructed by a Serbian inventor Veljko Milkovic.

Down is two-stage oscillator consisted of a lever and pendulum attached to it.

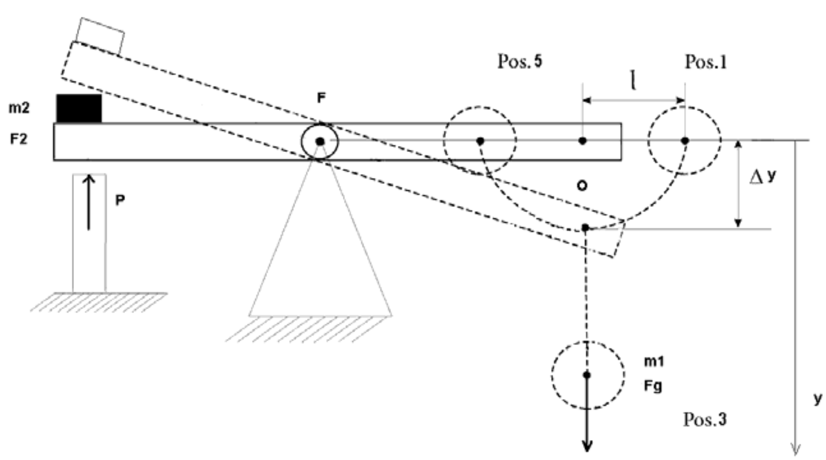


Figure 4.

Pendulum starts from position 1. To come to that position some external work has to be done equal to raising potential energy of the pendulum from the zero (from position 3) up to $Ep = m_1\, g\, l$ in position 1. On the left side of the lever, a weight with mass m_2 is in place. This mass must always be greater than mass m_1 of the pendulum in order to be able to prevail and press down if both arms of the lever have the same length as in Figure 4. It is a mistake to believe that this oscillator works like lever on the scale and has both masses equal. Masses could be equal if right arm were shorter than left one. Here lever with two equal arms will be examined. If someone wanted to make oscillator with right arm shorter he should take mass m_1 greater in the same proportion to balance moments of the forces.

Dimensioning of the Masses

To find right proportion of the masses we should look into formula for tension in the handle of the pendulum (13). Exactly the same force is found in the pivot of the pendulum *O*, but in the opposite directions (towards the bob). Starting angle of the pendulum φ_0 must be known before construction.

For example if starting angle was 90^0 like in Figure 3. and Figure 4. then maximum tension is down in Position 3 ($\varphi = 0$). From (13) it equals to:

$$T = m_1\, g\ (\ 3\cos(0) - 2\cos(90)\ ) = 3m_1 g \tag{40}$$

Minimum tension is in position 1 and for $\varphi = 90^0$ it is zero. This could be strange for some people, but it is easy to test. Take pivot of the pendulum in your hand and swing it from 90^0 to -90^0. It is easy to notice that pendulum really lost it weight in position 1 and position 5. However, if position 1 of the pendulum is not 90^0 then reaction is not zero in that position.

For starting angle of 60^0, maximum tension (in position 3) would be $2m_1g$. In further analysis it will be supposed that starting angle was 90^0. This means that mass m_2 must never be greater than $3\ m_1$, otherwise pendulum would never be able to pull lever down. Because it is necessary for pendulum to start prevailing in position 2 to have enough time to keep mass m_2 up till position 4, starting guess would be that mass $m_2 = 2\ m_1$.

Correct value can be found using formula (13) and angle we want pendulum to prevail. That angle is in position 2 and in Figure 3. it is 45^0. Note that force *T* will have the same angle of 45^0. Because pendulum pivot *O* can move only up and down along ***y*** axis component of the force *T* projected on ***y*** axis must be found as down:

$$T_y = T \cos(\varphi) \tag{41}$$

Combining (13) and (41) it comes that:

$$T_y = m_1 g\ (3\cos^2(\varphi) - 2\cos(\varphi_o)\cos(\varphi)) \tag{42}$$

For angle in position 2 formula (42) must be used to find T_y. In that angle two forces of the lever are in the balance like down:

$$F_2 = T_y \tag{43}$$

and because

$$F2 = m_2\, g \tag{44}$$

$$m_2 = T_y / g = m_1\ (3\cos^2(\varphi_c) - 2\cos(\varphi_o)\cos(\varphi_c)) \tag{45}$$

where φ_C is critical angle in position 2. If $\varphi_C = 45^0$ then $m_2 = 1.5\ m_1$.

If we wanted the lever to work harmoniously (the same time up and down) it must be taken into account that tangential velocity of the pendulum is not the same in any position and that it is faster down. So, passing time from position 2 till position 4 will be shorter and lever mass m_2 will be less time up than down. So, position 2 must be greater than 45^0 and better guess for mass m_2 should be found. Correct values can be calculated numerically by dividing arc from position 1 till position 3 in more sections and calculate average speed and time to pass each section. Length of the section can be calculated using (18) and speed using (12). By dividing these two values passing time for a section can be calculated. Then total passing time from position 1 till position 3 must be divided by two and found in which section it will happen. For that angle formula (45) should be used.

This way lever with equal arms will behave like balanced seesaw.

For a lever with arms which are not equal, formulas (43) and (45) are not correct. Here balance in position 2 and position 4 is achieved thanks to equal moments of the forces.

Moment of the force on left side of the lever is given as:

$$M_2 = (F_2 \times l_2) \tag{46}$$

Moment of the force on the right side is given as:

$$M_1 = (T_y \times l_1) \tag{47}$$

where l_1 is length of the right arm and l_2 is length of left arm of the lever.

Because $M2$ and $M1$ are equal in position 2 and position 4:

$$m_2\ g\ l_2 = m_1\ g\ l_1(3\cos^2(\varphi_C) - 2\cos(\varphi_O)\cos(\varphi_C)) \tag{48}$$

Mass m_2 can be calculated as:

$$m_2 = m_1\ l_1\ (3\cos^2(\varphi_C) - 2\cos(\varphi_O)\cos(\varphi_C))\ /\ l_2 \tag{49}$$

Work of the Oscillator

The work done by total vertical force T_y from critical point in position 2 downwards is passed to the left side of the lever and this work is used to increase potential energy of the mass m_2 as it went upwards. Once pendulum pass critical point upwards in position 4 (see in Fig. 3 total vertical force T_y will be less than F_2 and lever will go down on the left side and up on the right. Now mass m_2 on the left side is using potential energy passed by the pendulum as it goes down and can do some useful work as pumping water or press metal etc. In Figure 4 it just keeps bumping against the pillar.

It has been discussed that forces F_2 and T_y are in a balance in position 2 and position 4. There is no movement in these two positions and also there is no acceleration. If there is no acceleration there are no active forces there at the moment, or better to say all forces are opposite and canceled each other. So, force F_2 is zero at that moment. Because mass m_2 is not zero it comes that effective gravitation constant g' has become zero. This means that formula (8) can not be used to calculate potential energy of mass m_2. Effective force F_2 has variable intensity because it is opposed by T_y on other side of the lever and is not free like free mass allowed to fall down by gravity.

In position 1 and position 5 force T_y is week and F_2 is in its maximum.

Resultant moment of the forces on left side of the lever is given as:

$$M_2 = (F_2 \times l_2) – (T_y \times l_1) \quad (50)$$

Effective force on the left side would be:

$$F_2' = M_2 / l_2 = ((F_2 \times l_2) – (T_y \times l_1)) / l_2 \quad (51)$$

If both lever arm were equal as in Figure 4. then effective force could be calculated as:

$$F_2' = F_2 - T_y \quad (52)$$

It is known that angle φ in position 1 and position 5 become φ_o and formula (42) in position 1 and position 5 would be:

$$T_y = m_1\, g \cos^2(\varphi_o) \quad (53)$$

Changing (44) and (53) into (51) effective force in position 1 and position 5 is:

$$F_2' = (m_2\, g\, l_2 - m_1\, g \cos^2(\varphi_o)\, l_1) / l_2 \quad (54)$$

Because force F_2' in position 2 and position 4 was zero and in position 1 and position 5 it is given by (54), using linear approximation average effective force for downward movement of mass m_2 would be:

$$F_2'_{avg} = ½\, F_2' = ½\, g\, (m_2\, l_2 - m_1\, l_1 \cos^2(\varphi_o)) / l_2 \quad (55)$$

Force $F_2'_{avg}$ should be multiplied by distance Δy to calculate some average work done by mass m_2.

Important thing to note is that mass m_2 before the strike will have maximal downward velocity and after the strike that velocity will become zero. Here we have passing of the moment of the quantity of the movement ($m_2 \times v_2$) of the mass m_2 to the pillar. Any change in this value means that a force exists there. This is short impulsive force *P* in Figure 4. Not many models have included this fact into their calculations. Most models I saw supposed that lever never pass energy and is hanged in the air. Could be they excluded energy loss to calculate energy gain over the time in their formula, but this could be problematic. Lever keeps moving pendulum pivot up and down. When it strikes down pendulum pivot will go up and suddenly stop. This could affect pendulum work.

Pendulum Work and Energy Pump

Visually it is hard to notice any change of swinging of the pendulum affected by the lever movements. People tried to stop lever movements completely and pendulum continued to swing. Not visible changes were noticed after allowing lever to continue striking the pillar. However this could be deceiving as pendulum and lever are moving fast to allow the eye to see the changes. Lever is going up and down around fulcrum *F* and its tip travels along arc with total height Δy. Lever tip has both normal acceleration and also tangential acceleration which suddenly stops once left side strike against the pillar. It also has horizontal movement left and right as part of movement along the arc.

Colin Gauld noticed that if the pivot point is accelerating downwards with an acceleration *a*, the effect would be the same as gravitational constant would change from *g* to *g'* where $g' = g - a$ and the period becomes longer. This means that if the pendulum is allowed to fall freely under the action of gravity where $a = g$ then the period is infinitely long and the pendulum no longer swings. The opposite would happen if pivot point would be accelerating upwards. Here pivot is going up and down alternatively and it could mean that such changes would cancel each other. However, because of the facts that upward acceleration is suddenly stopped due to strike in the pillar and that normal acceleration in lever arm always exists in the same direction towards the fulcrum *F* it is not sure that lever doesn't affect swinging of the pendulum.

It is probably the most important claim that lever arm doesn't affect pendulum swinging. If it was true than it would be easy to say that pendulum keeps pumping energy into lever and because there is no return influence from the lever, oscillator is perpetuum mobile machine because pendulum would need only small external energy due to friction in the pivot.

Energy surplus would be easy to explain as a work done by vertical component of tension force T_y which is strong from position 2 till position 4 and week when pendulum is going upwards. Because of this fact downward work is much bigger than upward work. The difference in the work would be surplus used to bring mass m_2 upward. This would be the key of energy pumping from the pendulum into lever. However, except visual observation it is not proven yet that lever doesn't affect pendulum and stop it prematurely.

It is not enough just to prove that lever arm affects pendulum swinging. If lever arm prolongs pendulum swinging than oscillator would have energy surplus. If lever arm is stealing energy and stops pendulum prematurely it also must be proven that it doesn't give more energy than it takes from the pendulum.

Problems with Mechanical Feedback Loop and Mathematical Models

The question was raised on internet why Milkovic never succeeded in making mechanical feedback loop which would easy prove that oscillator is perpetuum mobile machine. I also asked Milkovic why not to build one instead of concentrate all efforts in improving oscillator. It would be sufficient propaganda and useful to build water pumps in this agriculture region of the country. He replied that he tried it once and had problem because loop actually stopped pendulum prematurely. It was found that mass m_2 had some lag and is not in phase with movement of the pendulum.

I wanted to try it myself and constructed oscillator from wood planks. I put several small levers connected together below main one and tried to solve the lag by using one spring which would be pressed by main lever and then fired once mass m_2 starts going up. I hoped that it would solve the problem. Next problem appeared because of lever movements up and down together with pendulum. It is not possible to strike pendulum unless striking rod is hanged on right side of the lever. Next and most important problem appeared. It was very visible by observing return rod striking into empty air that rod was following pendulum for short time correctly. After some time they were completely out of the phase. Pendulum was moving from position 3 towards position 4 when rod started striking. This of course would try to stop pendulum. Everything went into a circle. It was impossible to determine right time for rod to strike. Also the rod didn't strike the bob perpendicularly. Angle of the strike less than 90^0 would diminish strength of the strike.

The conclusion was that simple mechanical feedback loop could only work if instead of using pendulum, unbalanced wheel was used which rotates in one direction only. I also noticed that using a spring helped the lever to move less abruptly and more harmoniously. Lever had smaller amplitudes, but moving up and down lasted longer. However, spring had increased the lag of return rod and was the cause of cyclic out of the phase problem.

Problems with feedback loop helped me to realize that mathematical models for calculation of total energy for derivation by Lagrangian method is not completely correct. Because of lever lag against pendulum swings expected lever angle and angle of the pendulum were not connected properly in formula except at the beginning.

Possible Errors in Energy Measuring

Concerning measuring of the output energy by tools and devices my observation is this:

For levers with small mass m_2 it would be problematic to use tools which need extra weight to press the lever because it would unbalance the lever. If extra mass was pressing lever downwards only than it would prevent mass m_2 to receive moment of the forces from pendulum pivot and increase its potential energy. If pressing upwards only then it could speed up pendulum downwards and slow its swinging.

For greater output mass m_2, small additional mass for measuring would not do much damage.

Measuring of the input energy is more problematic. Because of the claims that machine can give out around 10 times more energy than it receives it means that input in pendulum is 10 times smaller and errors in measuring can do great harm. If a force was applied against pendulum it must be noted that the force must be perpendicular otherwise it will be wasted greatly. Second thing is that too short pulses hardly have influence on the pendulum movement. I had a chance to see demonstration of this with hand tapping. Pendulum was affected only if a hand was applied at right time and was rested a little bit on pendulum like glued. Short taps like knocking achieved nothing.

Instead of measuring pulsed force applied, I think it would be much better if input acceleration of pendulum was measured similarly like output acceleration of the lever.

However, the best way would be not to measure input at all, but to raise pendulum to desired height and leave it to complete stop. It is easy to calculate input energy of the pendulum using formula (8) for potential energy it received.

One pendulum cycle like this is enough for measuring output as the lever will go up and down several times.

Errors in Output Energy Calculation by Jovan Bebic

This part of the document is dedicated to measurement of oscillator performance by Jovan Bebic (http://www.veljkomilkovic.com/Images/Analysis_Jovan_Bebic_2-measuring.pdf). Input energy is given to the system only once by increasing potential energy of the pendulum. It has been calculated using formula (8) for potential energy. Output energy has been calculated by measuring distances left side of the lever passed from the upper position till striking down into the pillar until pendulum stopped. Then formula (8) has been taken again with mass m_2 of the lever. This is actually the problem of the calculation.

Important thing to note is that if we chose to raise pendulum to position 1 and leave it until it stops any new period of the pendulum will be smaller and smaller and every new *Δy* will be smaller and smaller. This is because for each new period position 1 is not on the same angle φ_o, but is going down. This means that for each new *Δy*, force $F_{2'avg}$ must be recalculated for some new φ_o' which is unknown and should be guessed. I will not do it here as it is not worth. It has been discussed in feedback loop section that because of lever lag there is discrepancy between position of the lever and position of the pendulum. I will use old $F_{2'avg}$ for φ_o for all amplitudes and regard the result as maximum value.

Recalculation of output energy

From the picture of the oscillator made by Jovan Bebic values are:

Length of the handle from pivot till center of the bob:	l = 33.5 cm
Initial height of the bob:	h = 3 cm
Left arm length	l_2 = 47.5 cm
Right arm length	l_1 = 22 cm
Mass of the lever	m_2 = 1.435 kg
Mass of the pendulum	m_1 = 2.675
Lever amplitudes	Δy_1 = 4cm, 5 times
	Δy_2 = 3cm, 6 times
	Δy_3 = 2cm, 32 times
	Δy_4 = 1cm, 26 times

Initial angle of the pendulum can be found from Figure 1 as:

$$h = l - l \cos(\varphi_o) \quad (56)$$

$$\cos(\varphi_o) = (l - h) / l \quad (57)$$

$$\cos(\varphi_o) = (33.5 - 3) / 33.5 = 0.91 \quad (58)$$

$$\varphi_o = 24.4^0$$

Changing values into (55) it comes that average effective force for φ_o is:

$$F_{2'avg} = ½ \, 9.81 \, (1.435 \times 47.5 - 2.675 \times 22 \times 0.91^2) / 47.5$$

$$F_{2'avg} = 2 \text{ N}$$

Energy for first 5 amplitudes: $E_{k1} = F_{2'avg} \times \Delta y1 \times 5 = 2 \times 0.04 \times 5 = 0.\ 40$

Energy for second 6 amplitudes: $E_{k2} = F_{2'avg} \times \Delta y2 \times 6 = 2 \times 0.03 \times 6 = 0.\ 36$

Energy for third 32 amplitudes: $E_{k3} = F_{2'avg} \times \Delta y3 \times 32 = 2 \times 0.02 \times 32 = 1.28$

Energy for fourth 26 amplitudes: $E_{k3} = F_{2'avg} \times \Delta y4 \times 26 = 2 \times 0.01 \times 26 = 0.52$

Total energy for all amplitudes: $E_{ktotal} = E_{k1} + E_{k2} + E_{k3} + E_{k4} = 2.56$ J

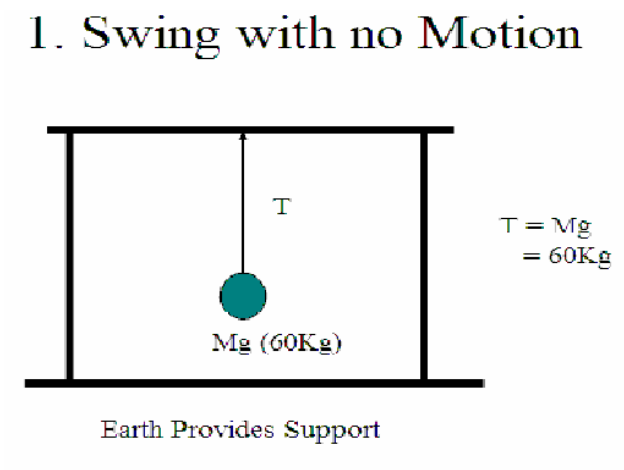
Because Input energy was 0.787 J and output was 2.56 J, performance was 3.25

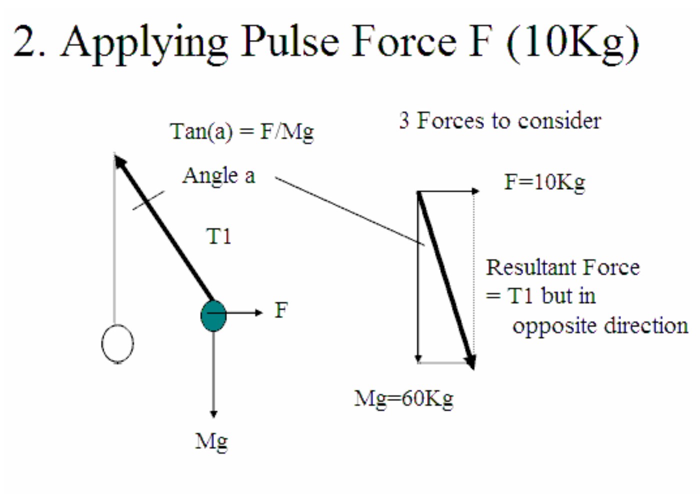
This is not so great performance as originally looked like. However, I found by guess and try method that here position 2 was around 5.5^0 and because φ_o was 24.4^0 this oscillator was out of balance. Out of the phase problem could greatly affect force *F2'* and amplitudes *Δy* of the lever. Hence, it is very important to balance masses of the oscillator before any measuring.

Errors in Lee Tseung Lead Out Theory

According to my understanding of various internet correspondences and documents Lee Cheung Kin and Lawrence Tseung developed this theory in order to popularize perpetuum mobile machines mainly using permanent magnets and ease application for their patent. They started from pendulum and gravitation force and expanded ideas to other physical forces.

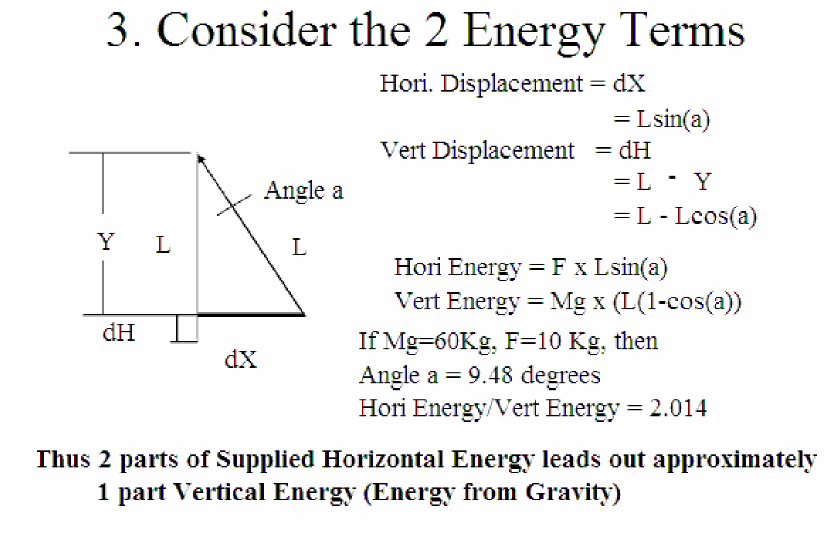
They used parallelogram of forces to analyze pendulum movement. Down are pictures from an internet presentation with analysis of pendulum with mass of 60 Kg and applied horizontal force of 10 Kg to move pendulum out of low position.





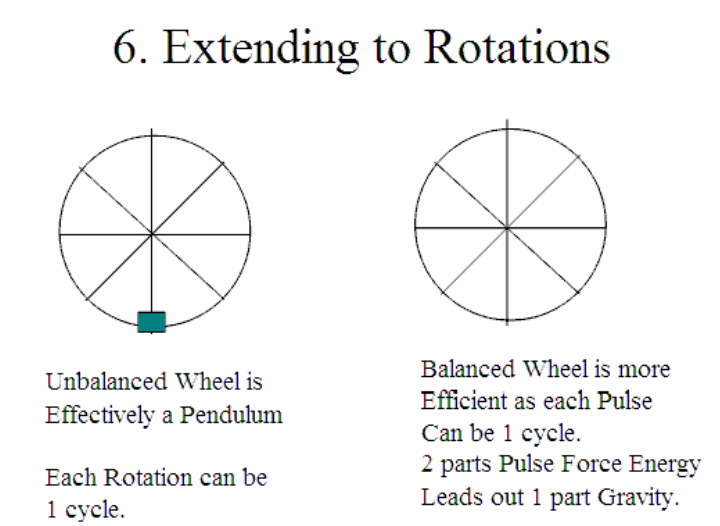
With horizontal force equivalent to the mass of 10 kg a pendulum with mass of 60 kg is pushed out of the balance. After some angle the balance is restored as in above picture. Resultant force is in the string and is found by adding two forces together using vector mathematics.

Down are calculated vertical and horizontal displacement of the mass, angle of the displacement and work done by components of the resultant force along corresponding displacement.



The problem with the last statement that "2 parts of horizontal energy leads out one part of vertical energy" is this: Horizontal energy has been **spent by doing horizontal work** in order to push pendulum up. Once pendulum is up it has some potential energy. Only way to use that potential energy is to allow pendulum to swing back into low position. The work done that way would be one part. This means that two parts were spent in order to have one part back. This is like investing two dollars and getting back only one (not as interest, but as principal). This would be excellent way to a bankruptcy.

One of the presentation pictures was this one down:



Part of the text following pictures was this:

"O*n the RHS, the balanced wheel with external pulse is shown. This is likely to be more efficient than the unbalanced wheel as the wheel can be rotated faster and there can be multiple pulse points on the wheel. An actual confirmation of this is available in the 225 HP pulse engine slide."*

I do agree that unbalanced wheel is a pendulum. Veljko himself and some other people used it for two-stage oscillator. However I do **not** agree that balanced wheel can be used for gravity machines. Balanced wheel has all forces in complete balance, which means one direction of the force is canceled by opposite one. Balanced wheel can only be used as gyroscope to continue to keep balance and not to do any useful work.

Latter, they decided to extend this theory to magnetic fields and all others. I do agree that instead of pendulum handle magnetic force can be used to keep pendulum mass moving, but to extend the theory to atomic levels is completely non scientific. It is just an empty claim. According to physics gravitational forces are useless on atomic level. There can be used only three forces: Electromagnetic, Week, and Strong force. The second one is affecting electrons and small particles and the third one is to keep protons in atomic core together as all protons are positive and electro static force would repel them from each other.

Note that I am not against so called zero point energy claims as I myself am familiar with ideas of using so called Ether or Orgone energies. Nikola Tesla came to etheric force by using rapid direct current pulses. John Warell Keely used sound for his machines. Viktor Shauberger used implosion technology and some people in Australia are using Joe cells for free car driving. However, I am against easy assumptions that some theory on macro level can be extended to atomic level just because somebody would like it to be so.

Conclusion for Two-Stage Mechanical Oscillator

From everything above said it is important to note that lever lag is a hindrance to creation of proper mathematical model of the oscillator. The inertia of the mass m_2 creates lag of the lever and position of the pendulum can not be easy guessed. Perhaps using camera and analyzing pictures until full cycle completes could help.

Recently I found in a document from reputable scientist information about Sir George Airy an 19th century scientist, director of Cambridge observatory and Astronomer Royal. He published a work "*On certain conditions under which a perpetual motion is possible"* where he said that if the force doesn't depend on the position of the body in the instant of the force's action on the body, but on some position of the body before the action, then the theorem preventing perpetual motion by conservative force would be no more applicable.

I do not know if out of the phase problem actually could qualify as a "previous position of the body" in above theorem or it is just a problem which should be minimized by correct construction of the oscillator. The best approach would be very careful construction of the oscillator and measuring its performances with sensitive tools taking into mind everything above said.

Main thing to have in mind is that if acceleration of pendulum pivot is in opposite direction of acceleration of the bob then pendulum speed will increase and period time (28) will decrease. Then surplus of energy in pendulum exists. If horizontal and vertical acceleration of the pivot is in same direction as acceleration of the bob, then effective gravitational constant will decrease and it means that potential energy of the bob is diminished. Then lever is stealing energy from the pendulum.

Historical facts about Bessler's wheel where great scientist like Leibniz had testified in favor is also adding oil to the fire of enthusiasm to continue research about possibility of perpetuum mobile machine.

INERTIAL PROPULSION CART

According to Newton's first law of motion, a moving body travels along a straight path with constant speed unless it is acted on by an outside force.

According to Newton's second law of motion, a change of quantity of the movement in time is proportional to the force and is in direction of the acting force.

According to Newton's third law of motion, for every action there is an equal and opposite reaction.

The consequence of the first law of motion is that in free space, outside of gravitational influence of planets and stars, a body can not change its movement by itself. An astronaut could move in free space only by using third law of motion to create an action and use reaction force which can be calculated according to the second law.

It could be done this way. If astronaut had a mass $m_1 = 100kg$. He could take with himself outside his ship a stone with mass $m_2 = 10Kg$. When necessary he could throw away this stone with speed of $v_2 = 10\ m/s$ and his body would move in opposite direction with speed v_1. The consequence of second law is that isolated system can not change its quantity of movement defined as *mass x velocity*. In above example isolated system consists of astronaut and stone.

This means that because astronaut and stone didn't move before his action sum of quantity of their movements must be zero all the time like down:

$$m_1 v_1 + m_2 v_2 = 0 \tag{59}$$

The speed of astronaut would be

$$v_1 = - m_2 v_2 / m_1 = - 1\ m/s \tag{60}$$

The minus in formula (60) means that reaction force and speed of astronaut is in opposite direction of the stone.

The rocket is using the same principle for movement. Instead of throwing away the stones it is using fuel particles. Their mass is very small, but the speed is very high and reaction force will raise the rocket up.

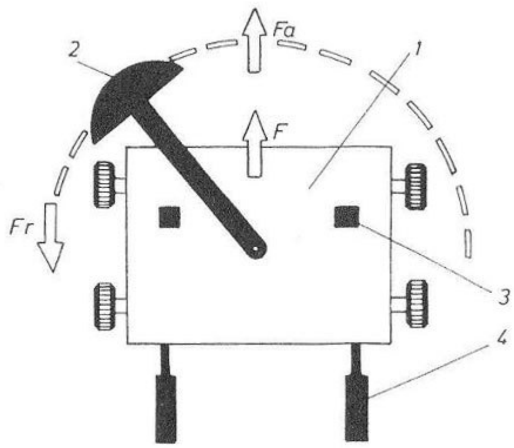
The car is using energy of the engine by transmitting it to the wheels and friction of the tires is creating action against the soil. The reaction will move car opposite of friction force.

The story of Baron von Munchausen about rescuing himself from a mud pool by pulling up his own hair brought him a title of great liar.

However, the story about Veljko Milkovic as 5 years old boy who created his own toy which was able to move forward by interior swinging of a glass cork brought a need of reexamination of Newton' laws.

Much latter he created a bigger toy with internal engine without using any transmission to the wheels. He used tilted pendulum as propulsion. Picture of his cart is down:

Down is graphical design of the same vehicle. It is not necessary to tilt pendulum for propulsion, but it that case it must be manually swing left and right. Tilted pendulum is using gravitation and it is necessary only once to unbalance it and then use pulses to compensate friction loses.



Picture 6. Truck with horizontal physical pendulum, 1 – truck, 2 – horizontal pendulum, 3 – elastic amplitude boundaries (spring, rubber, similar magnetic poles, etc.), 4 – ballance weight, Fa-the force of action, Fr-the force of reaction is amortized, F-the direction of the truck motion.

Pendulum is swinging from left to the right and resultant force has direction forward. As pendulum goes left or right it will have tendency to push the cart in that direction. Because it goes in both directions the side movement of the pendulum will cancel each other and the cart will have some jerking, but will go forward. To prevent jerking a weight can be used to balance the cart. It is on back side on the picture. Using two pendulums with swinging in opposite direction can minimize side jerking.

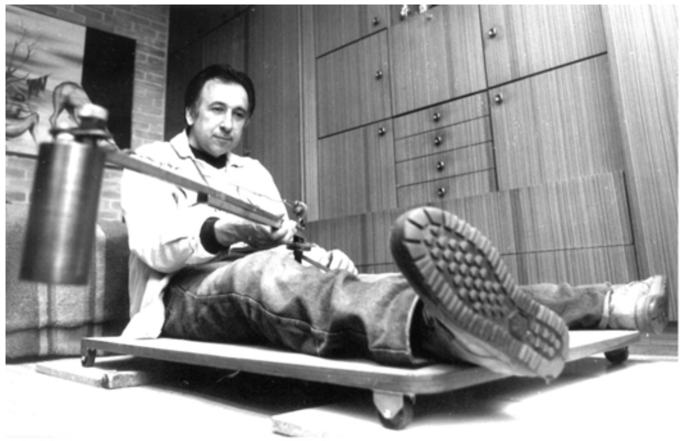
So, here with smart using of action force as rotation, the resultant reaction is going forward. This way a vehicle or space ship can move with internal propulsion engine without using a jet or friction against soil or air or water.

Accordingly Newton's first law should be adjusted that a body will keep its constant speed straight path until an outside **or internal** force change it.

Also, the law of conservation of quantity of the movement is completely violated here as both parts of the system, the cart and the pendulum didn't move at the beginning and latter they both got speed in the same direction.

Third Newton's law is partially corrupted as action and reaction are not in the opposite direction. Action was rotation and reaction was movement ahead of the cart.

Down is a picture with bigger cart with Veljko driving it manually.



Once in his cabinet Veljko stood on the scale and told me to measure his mass. Then he raised his hand above the head and started to swing it forward and backward. The numbers on the scale kept moving up and down, but newer they showed bigger mass then original. They had tendency to show 2 kg less than original and then come back. I think that this way Baron von Munchausen could be able to pull himself out of the mud.

Also, I think that an astronaut could move in free space the following way:

He should take two weights with himself, one in each hand. When he should move forward he should raise the hands with weights on his side till his shoulders. Then he should strike fast both weights one against each other in front of his chest and then slowly drop hands down close to the hips to be ready for new cycle. He would jump up and down as consequence of raising and dropping the hands, but he would go forward as the cart.

Some time ago I found on internet an article about Nikola Tesla's flying machine:

"***I am now planning aerial machines devoid of sustaining planes, ailerons, propellers, and other external attachments, which will be capable of immense speeds***" - Tesla's autobiography, "My Inventions." To a Westinghouse manager, Tesla wrote "***You should not be at all surprised, if some day you see me fly from New York to Colorado Springs in a contrivance which will resemble a gas stove and weigh as much. ...and could, if necessary enter and depart through a window.***" - TESLA: Man Out of Time, by Margaret Cheney, pg.198.

Thinking about unsuccessful ideas of other people and with knowledge of propulsion cart I got some ideas how cart could be improved to match Tesla's idea about flying stove. Possibly it could be driven manually on short distances. I will refrain from further descriptions until the time the idea is tested, to avoid possible bad surprises in practice.

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[4] Lazar Rusov, Ph.D, MEHANIKA, DINAMIKA, Naučna Knjiga, Beograd, Serbia

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[6] Greg Smith's internet site dedicated to Tesla's flying machine http://fuel-efficient-vehicles.org/tesla-flying-machine/Tesla-Flying-Stove-motor.php

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