

CANDLE LIGHTING TRICK

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ABSTRACT

ARTICLE INFO

IPT/IRPT2018

Accepted by Ariaian Young Innovative

Minds Institute , AYIMI

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Indeed, in this essay we are searching for finding an explanation to our problem. Why we can relight a candle from upside by a little distance of candle's top part? Actually we have some probable solutions for solving this problem. Some solutions are focused on paraffin part of candle. Some are focused on hot air that existed around candle. And other ones are which that we try to solve it by theories that insist on external elements which can effect on phenomenon.

Keywords : Candle, Paraffin, Hot air, Lighting

1. Introduction

Indeed, in this essay we are searching for finding an explanation to our problem. Really why we can relight a candle from upside by a little distance of candle's top part?

Actually we have some probable solutions for solving this problem. Some solutions are focused on paraffin part of candle. Some are focused on hot air that existed around candle. And other ones are which that we try to solve it by theories that insist on external elements which can effect on phenomenon.

First approach is made of theory that says relighting of candle is the cause of that evaporated paraffin and some fine particles of paraffin wax ; existed in around air of candle due to flame heat , so they will be alight by approximating a burning object to them.

Another one approach is based on heated air that existed around of candle, above it. Actually this insist on that the burning air reaches to the top of candle by effect of Archimedes' law that causes moving of fluid materials by their density. And then, burning air will relight candle.

And then the last theory is made of checking external elements that could effect on phenomenon and by checking them, we can talk about some explanations that are about burning source of fire and some other such as this.

For gaining a logical theory and reach to a strong solution which could win other explanations, we are forced to construct some tests. Our experiments are searching for testing our theories. Some are for testing that this phenomenon are because of paraffin or heated around air.

And some other ones are for testing that have any external elements, any important effect on this phenomenon. For reaching the answer we will construct some tests and will study results.

At the end we will study results and will construct a strong logical theory for solution and then study our solution's scientific features.

2. Related Reports, Technologies or Devices

By a simple search on internet, we will face to many fantastic results. For this phenomenon there is no important experiment that its aim be focused on gaining a scientific explanation for it. And also there is no scientific essay in scientific search engines. For this problem there

are some homemade experiments that are done by people, are recorded into video tapes and can be found on YouTube enough. These videos are recorded sometimes by experts and are under controlled laboratory conditions.

Actually we need to search for some key words by search engines and we will have some experiments with related results which their laboratory conditions are acceptable; of course under some determined limits.

In their experiments ; in almost more of them, the basic approach is about finding a way for relighting of candle, but without straight contact between candle burning part and a burning source of fire such as match. Then we can understand that there is a logical relation between burning source and top part of candle that burns, which can transfers enough heat to top part of candle in order to lighten it.

In almost all of them the only thing that is under studying, is the base of phenomenon and other aspects of phenomenon have not been tested in experiments.

Some fantastic and useful experiments are shown in footnote. It is good for reaching a scientific and logical explanation of phenomenon that see these videos online.

3. The Aims and Methodology

The same explained in previous section of essay, we mentioned that did not exist any strong and scientific approach and experiment that in it we could study every logical and scientific aspects of phenomenon. By the time there are no test could exam different theories that exists about explaining phenomenon.

We know that human mind logical perception always chooses some choices between others that they have needed adaptations to its limits. By this, we know that our choices will be limited by approaches which are about relations of relighting and three important factor.

Our method for testing these theories is experimentalism. Actually it determined by its many exams to test a theory. Theory could passes successful test or fails it.

Indeed we gain a totally and finally result based on limited observations that we could had through experiments. And those result which we named it a true theory, is just a theory that is not in contrast with any experiment which we done up to now.

It does not mean yet that it is a logical base or a natural

law.

We know that in laboratory for testing an elements and its effect on phenomenon we must fix any effective element in the experiment and then change one which is our purpose to be tested. Then we will gain some results that its changes is based on determined element. We can light a simple candle in a room with closed doors and windows due to air flow; air should be stable on a table. Then we relight it after a little minute by a burning source at top of candle. We can change source of fire for relighting every time. Once fired matches, once lighter and so on.

Other experiments are focused on two other elements that distinction between them is a little harder. We try relighting a simple candle that is turned off recently by setting up a burning source at top of candle.

Then we can change discussion subject by trying to relight a recently turned off candle's thread singly. If paraffin wax had any effect on phenomenon, by bringing out its thread and testing it singly, experiments results must change basically.

Another aim. Distance. We construct a series of experiments. For relighting in standard equal laboratory conditions but at different distances. And we will retry this experiments for different diagonals of candles and finally different dimensions of burning fire of candle. The constituent paraffin is important but its experiment is not focused in this essay.

Some factors such as density of air and air flow of room are not discussed.

Let's continue, we then will reach some limits to relighting it from around it and we will gain a maximum limit for it. And some limits for angles from vertical line to relight it. These are our basic methods to reach limits of relighting.

4. Experiments and results

In this chapter we want to know that our tests how work and what results is gained through experiments. Our experiments must will be in a laboratory condition room. This could help us to approaching less effective changing test elements.

Experiments guide us to find out how relights of candle works. First constructed experiment. We did change of external sources and then move to reach a logical explanation for results. No difference among relighting times or intension of fire not observed. Important part is just heat, fire.

Now let's see about effect of paraffin wax and hot air. We describe experiment previously. By standard scientific conditions we be sure our tests are reliable. One of our theories was that hot burning air around source of fire will reach to candle, because top of candle vertically has hot air that is heated by candle before, then new burning source has a fire. Then if burning part of source that is made of burning air, fuel or material, and some heated around air; had more density than air of top of candle, it will flow down to candle and relight it while candle's upside air perhaps had some particles of burning object that will effect on air density.

Then we must study something. What is paraffin. It is some kind of alkane with general formulation of $C(n)H(2n+2)$. Paraffin wax can its formula change among ($n = 20$) to ($n = 40$) in above mentioned formula. Let's show you some figures.

We will see in figure (1) that our products are H_2O , CO_2 , OH , C_2 , some carbon particles that will stay unburnt. In figure (2) we see that some evaporated wax particles existed in black soot of candle. Unburnt carbon particles and evaporated paraffin wax particles.

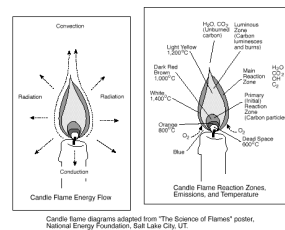


Fig. 1: Some carbon particles that will stay unburnt.

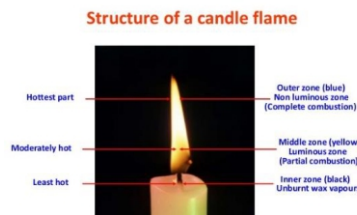


Fig.2: Some evaporated wax particles existed in black soot of candle

Note we can not say that because burning is stopped, we have no flow of unburnt carbon particles in the air. So answer is both of them.

For final experiments that we should change its diagonal and also its burning fire dimensions.

Results shows our flammable distance around candle has a limit. Actually it could not be relight by distance greater than 25 centimeters in average. It is 10.0 centimeters vertically above for our smaller candles. Limit for angle is 25 degree from vertical line. But has not observed any especial difference to intension of relighting among different angles.

Note our smallest candle mentioned bottom table.

Note we can change burning fire part of candle by changing its thread's length is out.

5. Example of Results

Candle's Diagonal	fire dimensions	maxi dist verti	angle limit
1.0 Cm	1.0 V 0.7 H	10.0 Cm	25 Deg
1.5 Cm	1.5 V 1.1 H	14.0 Cm	25 Deg
1.7 Cm	2.2 V 1.4 H	19.0 Cm	25 Deg
2.0 Cm	3.0 V 1.8 H	25.0 Cm	25Deg

We will face with a round figure around candle above it. It is rely on candle's diagonal length and how much candle's burning thread can produce fire, fire measure while burning is next factor that is related to its thread. And we can gain a maximum with a 2 centimeters diagonal with a burning fire with 3 centimeters vertically and 1.8 centimeters horizontally dimensions.

MATHEMATICS:

Max Dis = (Diagonal + Fire Length) * (Relation Constant)

Relation Constants :

5.00	4.66	4.87	5.00
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AVG = 4.88 (non unit)

Finally:

Max Distance = (Diagonal + Fire Length) * (4.88)
[General Linear Formula]

**fire width is neglected because it is related to its length, so we can consider one of them.