DOWNLOAD PDF CHAPTER 2 TREBUCHET

Chapter 1 : Trebuchet - Wikipedia

The trebuchet uses a weight attached to an arm with a sling on the end of it to throw objects. In its time, the projectiles varied, but were often big rocks or dead and rotting horses, thrown into the enemy fortifications during sieges.

One, she watched an amazing show on the Discovery channel, and two, she met her other dad. Frankly, the Discovery Channel won that round. For weeks she could dream of only one thing. The high, graceful arc, the vivid orange against the brilliant autumn blue, the deep, satisfying thud and splatter, the roar of the crowd or the twelve people there, but it sounded like a roar. It was a single, shining moment, a flash of clarity, a consuming feeling of purpose and direction. She recorded the show on Discovery, watched it a hundred times, then muted the audio and watched it a hundred more. Her machine of choice, she decided, would be the trebuchet. The way it spun and whipped and â€¦ and was just awesome, and mesmerizing, and the Best Thing Ever. The catapult was completely lame by comparison, stiff and brutal. The pumpkin cannons had no life, no majesty. The trebuchet looked like dancing -- with flying pumpkins. Oh, yes she was. But now, both she and the set had a purpose. A wicked awesome purpose. Darcy caved in under two minutes. The boy was a champion pouter. She waved her hand at the lopsided device. He knocked gently on the door and pushed it open, poking his head around. I know you and Sam are playing, but your mother and I need you in the living room. Nothing was coming to her. Friend on the outside, dark and evil on the inside. You guys can play again later. Just go to your room. I want to go with Darcy," he repeated but at a much greater volume. Darcy gave him a skeptical look. Darcy froze at the entrance to the room. Maybe this was about the desk. Maybe he was from the school board or something and they found out and now it was going to go on her permanent record. Her life could be ruined and she was only nine. The man looked up at her and smiled broadly. Your grandfather Howard was an old friend of mine. He was looking a little something, too. Garvey cleared his throat and smiled again. Mom made a small sound like a cough, and dad cleared his throat and said slowly, "A trebuchet, Darcy. His eyes slid away from her towards the hallway, "And a little brother. He waved Greg at her and then ducked away when dad looked over, too. Garvey sat back and smiled at her obvious suspicion. Your father would very much like to meet you, Darcy. She became increasingly frustrated and felt tears burning in her eyes. Let me make this very clear -- this is your decision. Nobody will make you; not me, not him, not anybody, and nobody will be mad at you. And if you do want to meet him, it will happen when you want it to happen. Garvey put his coffee cup down one more time and leaned forward, elbows on his knees and looked her straight in the eye. He went on to tell her about her other dad. How he was famous, how he was rich, and how he was Tony Stark. Man, he was such a girl, sometimes. Tony Stark being her dad seemed like it might be kind of cool. Well, cool until Mr. That was less awesome. One of the kids in a different class had a dad who was sometimes in sitcoms and people were always bugging him about the famous actors on those shows and asking him to get them autographs or stuff like that. It was super awkward. Though, mostly Cody used it to lord it over other kids and his gaggle of followers, because he was a super jerk. Though, suck it, Becca and Cody. Darcy felt a sort of swooping sick feeling in her stomach because this was becoming less cool and she kind of wanted to go back to a few hours ago where she was making a trebuchet with Sam and life was not Huge Scary Change. And then there was Tony Stark himself -- why did he want to meet her now? He was cool and rich and famous and a genius and, according to Marley and Rico, the best thing ever. And she was just She knew she was a good person Billy Holt deserved it , and that she was pretty cool, but What if he thought she was just a stupid little kid? She had a dad already, and he was great and she loved him and she knew he loved her and She really just wanted to go back to her room. Garvey finally got up to leave and gave her his card, telling her to take all the time she needed and to call him if she had any questions or just wanted to talk. He told her again how much she looked like her grandmother, then gave her a fond pat on the shoulder and left. Mom and dad gave her their serious looks and asked her to talk to them, but, no, really, she just wanted to go to her room. Taking a deep breath, she stared very intently at her listing weapon of pumpkin destruction and decided there was nothing for it, but to tear it apart and start over again. This she could do. This she could figure out. Darcy had just rebuilt the base and was starting again on the legs, when her dad

knocked on her door and slipped in. He never did before. Maybe it just took him this long to realize the same thing.

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Chapter 2 : Peter Pan Full Text - Chapter 2 - The Shadow - Owl Eyes

Unlike the coil gun of the previous chapter, trebuchets do this in an efficient manner. The action of a trebuchet is shown in the sequence of diagrams in Figure The action of a trebuchet is shown in the sequence of diagrams in Figure

A fiendish ton war machine hurls a 5-ton load of rocks, garbage, and bodies of plague victims onto panicked warriors. A dream problem for Galileo? Let us imagine Galileo as he began to get a reputation for developing a new science of mechanics. One day he is asked if he could improve the mechanics of an ancient war machine called the Trebuchet. If he succeeds in this endeavor, then physicists everywhere and for all time, will have a good story to tell their students. Far from being his dream problem, developing the theory of the trebuchet would more likely have become a nightmare. The trebuchet treb-yew-shay , a fiendishly clever double arm catapult shown in Fig. Using differential equations gives the following. Such mathematics was not available to Galileo. In spite of this, one may grant Galileo partial credit on the trebuchet problem. It is just a pair of compound coupled pendulums. He is known for the first quantitative analysis of the simple pendulum. Small throwing arm l of the trebuchet acts like a simple pendulum after it has thrown its projectile and the big arm r comes to rest upright. We could speculate that an image something like Fig. As is often told, Galileo observed swinging lamps in a Chapel. He may have been first to note that small-angle simple pendulum oscillation rates depend on length but not mass and similarly for descent rates of bodies dropped from the tower of Pisa neglecting air drag if in fact he ever did that. Any connection seen by Galileo between chapel lamps and business end of the terrible trebuchet is pure speculation. This would be the first step of an analysis, which is the breaking down of a complex problem into idealized but doable parts. Galileo analyzed simple pendulum oscillation indicated in Fig. The neat Cartesian coordinate equations 2. Generalized curvilinear coordinates GCC will be our first topic. Instead of thanking or paying him for his efforts, they might very well have just shot him on the spot! Differential equations, by themselves, are quite useless unless you can solve them. As we will see below, the resulting trebuchet equations do not have easy exact analytic solutions. Often one solves such equations numerically many times to learn something about mechanics. To do this in a reasonable amount of time such as one semester one probably needs to use a computer. We call this a solution by synthesis; one makes a synthetic or mathematical model or analog to approximate the real thing. Solution by analysis, on the other hand, is an art of idealizing and approximating the problem in terms of its doable parts. These are topics of Units 2 and 3 that expose Lagrangian and Hamiltonian ideas. But, once again, poor Galileo! Even if he had Lagrange equations and invented computers with integration routines another century of work there is still a missing step needed to finish the trebuchet assignment. Lagrange equations are not in a suitable form for numerical integration. Rather the equations need to be what we call Riemann Equations. This form, introduced in Chapter 2. You might find it useful to study both Units in tandem. The last step is a small one compared to all the others. However, it may be big enough to discourage descriptions of the trebuchet in standard mechanics books. In two engineers built a trebuchet at Shropshire that tossed a piano over a hundred meters! Scientific American July They pointed out that the trebuchet was also called the ingeneium or "ingenious device. They may express disdain for such a specialized device. Now, it is true that the trebuchet became a truly awful weapon when it was used for biological warfare by hurling bodies of plague victims into castles under siege. But, such excuses wear thin. Observant physicists may note the core problem is the motion of the trebuchet which duplicates human throwing, chopping, digging, cultivating, and reaping motions that have been executed billions of times to bring human history and culture to the point where it is now. In fact, it is probably closer to historical truth to say that it is the trebuchet that mimics the human throwing or chopping motion. It is a human analog. It appears that physicists have, since the beginning of their field, been avoiding discussion of a fundamental mechanical motion that is responsible for building a livable world over countless millennia. Nowadays power machines do most of our chopping, digging, cultivating, and reaping. Strangely, however, it seems that this has made this particular physics problem even more acutely relevant. In a leisure culture, humans seem unable to stop their chopping, digging, cultivating, and reaping motions, as they become fascinated and habituated to a multitude of lever-sports including baseball, golf, tennis, hockey or lacrosse that

mimic these motions. Details are in Chapter 7. Generalized Curvilinear Coordinates GCC and derivatives The first step in advanced mechanics problems is to choose a convenient set of coordinates to describe the state or position of a system or machine. For large mechanical systems the bending and stretching is problematic. Some trebuchets had masses of ten or twenty tons and threw to kilogram projectiles. Such consideration is called dimensional analysis and should be part of the repertoire of a physicist or engineer. Relating GCC to CC Cartesian coordinates A second step after choosing coordinates is to relate the chosen coordinates to Cartesian coordinates of all masses that will move when the system gets going. The trebuchet in Fig. The Cartesian coordinates are as follows. Signs are a major source of errors. Here is a helpful point. Before beginning further calculations you should check that the coordinates are consistent for easily visualized end points. Three such points are shown in Fig. Since generalized coordinates are usually non-linear, that is curvilinear, there is plenty of chance for them to become crazy. The third step in GCC analysis uses the partial differential chain rule to relate linear differentials of Cartesian coordinates to GCC differentials. There are too many! Not big changes as in Fig. You can change one or more of them quite arbitrarily without breaking arms of the trebuchet. For example, you cannot increase X without also changing Y unless you want to break off the R-arm of the trebuchet and void your warranty. An unbroken trebuchet straight from the factory must satisfy a Pythagorean relation of the form 2. The same goes for Cartesian x and y coordinates of the mass m. However, it looks like x and y are independent because you can imagine grabbing little m like the handle on a swivel lamp and moving it until it reached the limit of the swing. Indeed, x and y are quasi-independent as we will now see. But, they are not independent of X or Y, unless you break the trebuchet in two. To evaluate dependency one uses Jacobian differential relations. But, we might be able to find a square sub-matrix of the Jacobian rectangle that would be invertible. X and Y are dependent. However, the last two rows are invertible. Recall x and y are quasi-independent. The matrix inverse exists if the determinant is not zero but blows up when. Independence fails if the Jacobian matrix inverse fails. If a Jacobian matrix relation has an inverse, as in the following, it will be called a Kajobian matrix. The two partial derivative Jacobian and Kajobian matrices are, by construction, inverses of each other. Partial derivative chain-rule relations have chain-sums over its quasi-independent x and y variables. A left-inverse is a right-inverse. Some more discussion of this is given in Unit 3. Generalized coordinate differentials lead immediately to generalized velocities. For the trebuchet the velocities follow immediately from the Jacobian chain sums 2.

Chapter 3 : Chapter Trebuchet - blog.quintoapp.com

Sorry for the long delay! Being in the all-school musical takes it's toll (including singing karaoke in front of all your friends and enemies for the cast party) but now it's spring break, so more time to get so totally wasted on the internet! x3.

The trebuchet uses a weight attached to an arm with a sling on the end of it to throw objects. In its time, the projectiles varied, but were often big rocks or dead and rotting horses, thrown into the enemy fortifications during sieges. Figure shows the trebuchet ready for action. Trebuchets are elegant machines that convert the potential energy stored in a counter-weight into kinetic energy in the projectile. Unlike the coil gun of the previous chapter, trebuchets do this in an efficient manner. The action of a trebuchet is shown in the sequence of diagrams in Figure The trebuchet has a sling attached to the throwing arm. So, initially the projectile is almost underneath the weight Figure A. As the weight falls, the throwing end of the arm rises, pulling the sling and projectile along the slide on the base of the trebuchet. At some point, the projectile leaves the slide B and is swung round in a wide arc as the weight keeps falling C. The sling has one end attached to the top of the throwing arm, and the other end attached to a ring that fits over a hook on the end of the throwing arm. As the arm passes the vertical mark, at some point the sling will slacken and the ring will slip off the hook, releasing the projectile D. All of these can be easily obtained from hardware stores, and in the case of the plastic container, a supermarket. Note that lumber is sold in different standard sizes in different countries, so you may not be able to get exactly the same size. This should not matter, and if in doubt, use thicker, more solid wood. In addition, you will also need the following tools: Assembly The cutting list for this in Table includes all the wood you will need for the project. The author used inches in this project; it seemed appropriate for such an ancient design. So, those measurements are the more exact figures. Make the Frame Sides The first step in this project is to build the frame sides. So, before attaching the plate, drill a hole right in the center, big enough for the bolt to pass through. Figure shows the plan for one of the A-frames. One of the A-frames is shown in the photograph of Figure The sections of wood are just screwed together with a pair of screws at each joint. Build the Throwing Arm Figure shows the construction of the throwing arm. Drill one large hole to fit the bolt used, and two smaller holes for the weight ropes and for attaching the permanent end of the sling. Straighten out the metal hook Figure and screw it into the end of the throwing arm. You will need to use pliers to grip the hook while you screw it into the end of the throwing arm. Build the Base The structure of the base is shown in Figure We start by fixing the two A-frames together at the base, using two lengths of wood J and K in the cutting list placed under the A-frames. There should be a gap of about 7 inches mm between the A-frames at the base. Also attach the central strut L that will hold the side braces, and piece M that runs down the center of the base to support the runway board and trigger mechanism. At the top of the frames, fit the bolt through one plate, a nut, and then the throwing arm and the second plate Figure Fit a nut on the inside of the bracket before the second plate. The nuts are going to hold the two A-frames apart against the side bracing. Attach the Side Braces The side bracing is formed by a cross piece under the middle of the A-frames L and two struts O and P from the bottom of the strut up to the apex of the A-frames Figure The struts and braces are both fixed into place using screws. Drill the struts at an angle first and use long screws. More adept woodworkers may elect to cut the ends of the struts at angles so they fit better. Assemble the Weight The weight is constructed from a plastic box designed to hold breakfast cereal. The box has a pint 5 L capacity, which when filled with wet sand will have a weight of about 18 pounds 8 kg. Before filling the container, we need to drill four holes near the rim Figure Cut two inch mm lengths of the nylon rope and thread them through the holes drilled in the food container and the hole at the weight end of the throwing arm. The rope should be just long enough to allow the weight to stay away from the rotating end of the throwing arm, without being so long that the weight hits the ground at its lowest position. Check the travel of the whole mechanism, and make sure that there is enough clearance between the A-frames for the weight. Figure shows how the container will eventually be attached. Note that it is shown here filled with sand, but it is better to wait until everything is assembled before you fill the container. Assemble the Sling The sling Figure is made from 64 inches mm of the rope with a square patch of cloth, 8" 10" mm mm. A reasonably strong material like denim is ideal. The Evil Genius tells

them that this is the latest fashion and the minions are pleased. Lay the rope across the cloth as shown in Figure and fold the edges over to make a seam enclosing the rope. Sew the seams up, or if you prefer, apply a row of staples down each side. Sewing will be a lot more durable than staples. Tie a loop into one end of the rope. This will fit over the hook of the throwing arm. Create the Runway The runway is a rather grand name for the smooth panel of hardboard N. It is along this that the projectile will be pulled before it is lifted by the rotating arm. It fits on top of piece M Figure that sits across the base and doubles as the point to attach the trigger mechanism. Fashion the Trigger Mechanism The trigger mechanism is quite unsophisticated. It comprises a nail on a string and a hole that goes through the throwing arm and the piece of wood M Figure To fire the trebuchet, simply pull the nail out. A tennis ball makes a good projectile. It has the advantage of being fairly tough and not being damaged by a collision with a target minion. To test the trebuchet, a suitable open space should be found and minions dispatched to a reasonable distance in front of the trebuchet. Fit the ball into the sling and pull down the throwing arm until it can be pinned by the trigger nail. Stretch out the sling in the runway, with the ball at the far end, so that the rope is straight and the loop is over the pin on the end of the throwing arm. Stand clear of the trebuchet and pull on the string to release the nail holding the throwing arm in place. The ball should sail off into the distance. Tuning the Trebuchet There are various things you can do to the trebuchet to squeeze the best performance out of the engine. You will likely need to make a few adjustments to the pin before this works well. If the ball flies off too low to the ground, then bend the pin back a little so the sling is released earlier. Or, if the ball is released too early and flies straight up into the air, bend the pin forward a little. These may be useful to refer to. Theory The trebuchet takes its energy from the weight that falls as the arm swings. As we know the energy stored in the weight and know how far the tennis ball can be thrown, we can calculate both the energy going into the system and the energy released into the ball by the system. This will allow us to calculate the efficiency of our trebuchet. The input energy can be calculated using the formula: So the energy in joules is approximately:

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Chapter 4 : physics homework page

Chapter 2: CSS Syntax the color from the font-family with a semi-colon, separated the various fonts with commas and contained the "Trebuchet MS" within.

Use of video content is at your own risk. How to make 3 epic mini weapons for office warfare! Someone follow me on Twitter! Pic of angry office person via- Music- and Building A Trebuchet For Kids See for context on how to make your next miniature castle siege successful and the physics of why Impress your friends including that fair damsel in your life when you hurl melons, toasters, pumpkins, small animals just kidding , balls and those dreaded fruitcakes, the length of a football field How To Make An Easy Catapult How to make a simple catapult made out of mostly Popsicle sticks, that launches small things, using all everyday items. Full instructions, and simple to make For more stuff like this feel free to subscribe or checkout my blog This is how it turned out. We need to add some heavier counterweights and it will fly much farther. We got ideas for the design from this very helpfu Joseph Budka of Pagoda Studios is building the catapult-like medieval siege weapon, and describes the catastrophic failures endured along the way. Joseph dives into the Medieval Engineers - Building A Catapult! Wondering how to build a catapult in Medieval Engineers? Built from the book: One of 40 fully illustrated step-by-step builds for building a secret agent arsenal. Besiege is a physics based building game in which you construct medieval siege engines and lay waste to immense fortresses and peaceful hamlets. Check out more gameplay videos with Besiege: Very Powerful Homemade Mini Catapult This catapult is awesome because it is small, but very powerful. I learned how to make this catapult looking to this complete tutorial Koen Mangeslchots Me Level: Pencil, Low temperature hot glue gun and Scissors My Blog: Building A Mini-trebuchet Remember to leave a like, especially if you want to see me build more things and such. I found this little thing at a toy store and decided I would try and build it. Little did I know. Tutorial Just in case someone wanted to know how i built mine. No wood or power tools are used. See for more catapult designs like this one The trebuchet has a swing arm approximately 10 feet long and has a maximum range of Darbin Orvar Shoppe I want to thank the sponsor of this video. You can find this video on the site: Building A Trebuchet Westley Skogen builds and tests a 25 foot tall medieval style trebuchet. A trebuchet was first designed as a weapon of war, utilizing a sling release system as oppose to a catapults fixed arm. This particular trebuchet was featured in two local newspapers. The Marshall Independent and the Canby News Hopefully, this will show you how to use square and diagonal lashings to tie the pencils together to make a frame as well as give you guidelines for tuning. However, if you want additional informati Just like in boat building, woodworkers often make smaller models of the ideas and designs and in the video we make a table top size Trebuchet. I tried to do it in ten minutes. I will be posting complete plans for this torsion catapult on my website. You just need some rope and a few pieces of wood. I call this catapult "The Wyvern". When you use twisted rope like this the catapult is called a It is made out of old wood and some rope. It will chuck almost anything that can fit in the sling. It can launch small objects several feet if used correctly. Have fun and be careful not to shoot anybody. Mini Trebuchet catapult We built two small trebuchets for a school project a couple years back. They use a cigar box filled with lead shot for a counterweight, are made of oak, and use a wheel and free-hanging counterweight design. This allows the trebuchet to function with a smoother motion, and more efficient use of the Range Feet varies due to build and rubberband One of 40 fully illustrated step-by-step builds for building implements of spitball warfare. An excellent inquiry project, something to introduce projectile motion, or just as a really cool activity in the classroom. Great for most ages. Full lab description available FREE, click to see. Bought one of these through Kickstarter when the company was starting up. Still deciding what to lay siege to Mini trebuchet - Google Search Picture of how to make a mini trebuchet catapult How to make a mini trebuchet catapult Catapult set, maybe a present for J and G someday Pocket Sized Minty Catapult. Could use spring under spoon instead of homemade contraption Introducing Your New Mini Trebuchet by oaklandballistics Great ideas for miniature versions of historical built catalpults out of clothespins, rubberbands, binder clips, and a spoon. Pom-poms from the craft store made safe projectile to launch at castle made from recycled materials

Chapter 5 : CSS Syntax - CSS Basics - Chapter 2

The velocity of a projectile is calculated using rotational inertia and conservation of energy for a trebuchet.

Though it is not too confusing, once you take a look at it. It consists of only 3 parts. The property is the actual property title, and the value is the style you apply to that property. Each selector can have multiple properties, and each property within that selector can have independent values. The property and value are separated with a colon and contained within curly brackets. Multiple properties are separated by a semi colon. Multiple values within a property are sperated by commas, and if an individual value contains more than one word you surround it with quotation marks. The final result sets the body color to light grey, and sets the font to ones that most users will have installed on there computer. I have changed the way I layout my code, but you can arrange it in one line if you choose. I find that it is more readable if I spread each property to a separate line, with a 2 space indention. Inheritance When you nest one element inside another, the nested element will inherit the properties assigned to the containing element. Unless you modify the inner elements values independently. For example, a font declared in the body will be inherited by all text in the file no matter the containing element, unless you declare another font for a specific nested element. If you wanted to style certain text with another font, like an h1 or a paragraph then you could do the following. There are instances where nested elements do not inherit the containing elements properties. For example, if the body margin is set to 20 pixels, the other elements within the file will not inherit the body margin by default. Each one is separated by a comma. The final result of the above code sets all headers to green and to the specified font. If the user does not have the first font I declared it will go to another sans-serif font the user has installed on their computer. Comment tags Comments can be used to explain why you added certain selectors within your css file. You can add comments that will be ignored by browsers in the following manner.

Chapter 2 - CSS Syntax. The syntax for CSS is different than that of (X)HTML markup. Though it is not too confusing, once you take a look at it.

Darling screamed, and, as if in answer to a bell, the door opened, and Nana entered, returned from her evening out. She growled and sprang at the boy, who leapt lightly through the window. Darling screamed, this time in distress for him, for she thought he was killed, and she ran down into the street to look for his little body, but it was not there; and she looked up, and in the black night she could see nothing but what she thought was a shooting star. As he leapt at the window Nana had closed it quickly, too late to catch him, but his shadow had not had time to get out; slam went the window and snapped it off. You may be sure Mrs. Darling examined the shadow carefully, but it was quite the ordinary kind. Nana had no doubt of what was the best thing to do with this shadow. She hung it out at the window, meaning "He is sure to come back for it; let us put it where he can get it easily without disturbing the children. Darling could not leave it hanging out at the window, it looked so like the washing and lowered the whole tone of the house. She thought of showing it to Mr. Darling, but he was totting up winter great-coats for John and Michael, with a wet towel around his head to keep his brain clear, and it seemed a shame to trouble him; besides, she knew exactly what he would say: The opportunity came a week later, on that never-to-be- forgotten Friday. Of course it was a Friday. Darling always said, "I am responsible for it all. I, George Darling, did it. They sat thus night after night recalling that fatal Friday, till every detail of it was stamped on their brains and came through on the other side like the faces on a bad coinage. Darling never upbraided Peter; there was something in the right-hand corner of her mouth that wanted her not to call Peter names. They would sit there in the empty nursery, recalling fondly every smallest detail of that dreadful evening. Darling had come in, wearing her white evening-gown. She had dressed early because Wendy so loved to see her in her evening-gown, with the necklace George had given her. Wendy loved to lend her bracelet to her mother. Darling, that you are now a mother," in just such a tone as Mr. Darling himself may have used on the real occasion. Wendy had danced with joy, just as the real Mrs. Darling must have done. Then John was born, with the extra pomp that he conceived due to the birth of a male, and Michael came from his bath to ask to be born also, but John said brutally that they did not want any more. Michael had nearly cried. Such a little thing for Mr. They go on with their recollections. Darling would say, scorning himself; and indeed he had been like a tornado. Perhaps there was some excuse for him. He, too, had been dressing for the party, and all had gone well with him until he came to his tie. It is an astounding thing to have to tell, but this man, though he knew about stocks and shares, had no real mastery of his tie. Sometimes the thing yielded to him without a contest, but there were occasions when it would have been better for the house if he had swallowed his pride and used a made-up tie. This was such an occasion. He came rushing into the nursery with the crumpled little brute of a tie in his hand. Oh yes, twenty times have I made it up round the bed-post, but round my neck, no! Some men would have resented her being able to do it so easily, but Mr. Darling had far too fine a nature for that; he thanked her carelessly, at once forgot his rage, and in another moment was dancing round the room with Michael on his back. Darling now, recalling it. Darling collided against her, covering his trousers with hairs. They were not only new trousers, but they were the first he had ever had with braid on them, and he had had to bite his lip to prevent the tears coming. Darling brushed him, but he began to talk again about its being a mistake to have a dog for a nurse. Darling said thoughtfully, "I wonder. At first he pooh-poohed the story, but he became thoughtful when she showed him the shadow. You will never carry the bottle in your mouth again, Nana, and it is all my fault. Darling left the room to get a chocolate for him, and Mr. Darling thought this showed want of firmness. What he did not know was that the faithful Liza had found it, and put it back on his wash-stand. Immediately his spirits sank in the strangest way. Wendy was quite puzzled.

Chapter 7 : How to Build a Trebuchet (with Pictures) - wikiHow

A trebuchet (French trÃ©buchet) is a type of catapult, a common type of siege engine which uses a swinging arm to throw a projectile.. The traction trebuchet, also referred to as a mangonel at times, first appeared in Ancient China during the 4th century BC as a siege weapon.

Basic design[edit] Side view of counterweight trebuchet The trebuchet is a compound machine that makes use of the mechanical advantage of a lever to throw a projectile. They are usually immobile and must be assembled on-site, possibly making use of local lumber with only key parts brought with the army to the site of the siege or battle. A sling is attached to one end of the beam to hold the projectile. The projectile is thrown when the beam is quickly rotated by applying force to the opposite end of the beam. The mechanical advantage is primarily obtained by having the projectile end of the beam much longer than the opposite end where the force is applied â€" usually four to six times longer. Traction trebuchets are human powered; on command, men pull ropes attached to the shorter end of the trebuchet beam. The difficulties of coordinating the pull of many men together repeatedly and predictably makes counterweight trebuchets preferable for the larger machines, though they are more complicated to engineer. So while counterweight trebuchets require significantly fewer men to operate than traction trebuchets, they require significantly more time to reload. In a long siege, reload time may not be a critical concern. When the trebuchet is loosed, the force causes rotational acceleration of the beam around the axle the fulcrum of the lever. These factors multiply the acceleration transmitted to the throwing portion of the beam and its attached sling. The length of the sling increases the mechanical advantage, and also changes the trajectory so that, at the time of release from the sling, the projectile is traveling in the desired speed and angle to give it the range to hit the target. The rotation speed of the throwing beam increases smoothly until it reaches maximum rotation speed. Then the arm continues to rotate, slowing, coming to rest at the end of the rotation rather smoothly as momentum is transferred to the sling and its projectile. This is unlike the violent sudden stop inherent in the action of other siege engine designs such as the onager , which loses energy thereby. This key difference also makes the trebuchet much more durable, allowing for larger and more powerful machines. A trebuchet projectile can be almost anything, even debris, corpses, or incendiaries , but is typically a large stone. Dense stone, or even metal, specially worked to be round and smooth, gives the best range and predictability. When attempting to breach enemy walls, it is important to use materials that will not shatter on impact; projectiles were sometimes brought from distant quarries to get the desired properties. Chinese siege weapons The traction trebuchet, also referred to as a mangonel in some sources, is thought to have originated in ancient China. They were probably used by the Mohists as early as 4th century BC, descriptions of which can be found in the Mojing compiled in the 4th century BC. In Li Mi Sui dynasty constructed trebuchets for his assault on Luoyang , in Li Shimin did the same at Luoyang, and onward into the Song dynasty when in , trebuchets operated by Song dynasty soldiers fired bombs of lime and sulphur against the ships of the Jin dynasty navy during the Battle of Caishi. The term was created mainly to distinguish it from the onager, a torsion powered artillery weapon which is often confused with another name for the traction trebuchet, the mangonel, a generic medieval term for stone throwing artillery. Confusion between the onager and mangonel in terminology has led some historians today to use traction trebuchet instead. Basically a one-man traction trebuchet, it was used by emperor Nikephoros II Phokas around to disrupt enemy formations in the open field. It was also mentioned in the Taktika of general Nikephoros Ouranos c. Chevedden, a hybrid trebuchet existed that used both counterweight and human propulsion. However no illustrations or descriptions of the device exist from the time when they were supposed to have been used. The entire argument for the existence of hybrid trebuchets rests on accounts of increasingly more effective siege weapons. Peter Purton suggests that this was simply because the machines became larger. The earliest depiction of a hybrid trebuchet is dated to , when trebuchets had already become obsolete due to cannons. The earliest known description and illustration of a counterweight trebuchet comes from a commentary on the conquests of Saladin by Mardi ibn Ali al-Tarsusi in They were used in Germany from around , in England at least by , and in Iberia shortly after By the s the counterweight trebuchet was a

common item in siege warfare. Chevedden argues that counterweight trebuchets appeared even earlier in Europe based on what might have been counterweight trebuchets in earlier sources. The 12th century Byzantine historian Niketas Choniates may have been referring to a counterweight trebuchet when he described one equipped with a windlass , which is only useful to counterweight machines, at the siege of Zevgminon in After failing to take the twin cities of Fancheng and Xiangyang for several years, collectively known as the Siege of Fancheng and Xiangyang , the Mongol army brought in two Persian engineers to build hinged counterweight trebuchets. Ismail and Al-aud-Din arrived travelled to South China from Iraq and mangonels and trebuchets for the siege. Its greater range was however, somewhat countered by the fact that it had to be constructed close to the site of the siege unlike traction trebuchets, which were easier to take apart and put back together again where necessary. The counterweight is split into two halves to avoid hitting the center frame. Trebuchets were still used both at the siege of Burgos â€" and siege of Rhodes Accounts of the attack note that its use was motivated by the limited supply of gunpowder. The attempt was reportedly unsuccessful:

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