The Hand-drill

By
Alan Halcon

Introduction

Growing up, I had a fascination with the outdoors. Every summer my dad would take us camping. After each trip, I would find myself preparing for the next trip by reading anything that I could on camping and outdoor survival. I remember hopping on my bike, riding to the local library, and sitting there for hours just looking through all the books on camping. I would constantly beg my mom to take me to the local sporting goods store in order to check out all the camping gear... She used to hate it. My mom knew she couldn't leave the store without buying me something.

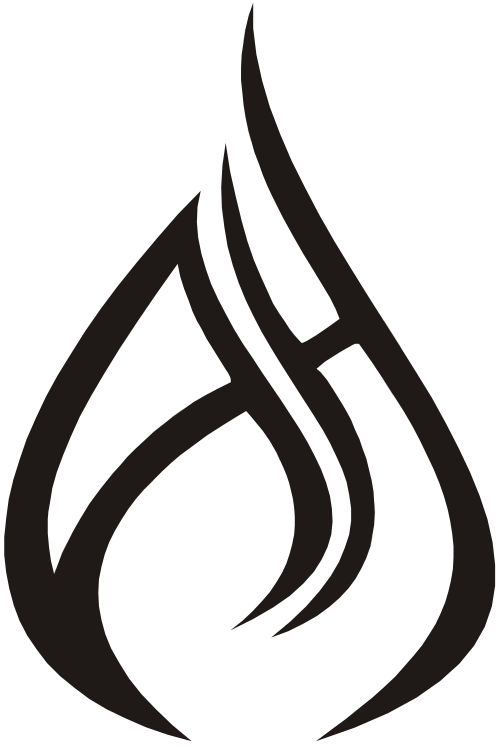
As time went on and I got older, my mind became distracted with other things and it just wasn't cool to go camping with your parents anymore. The times I spent camping with my father were now becoming a distant memory. It wasn't until later on in life, when I had kids, that my passion for the outdoors would resurface.

Early one spring, while I was clearing out some boxes from the attic in my mom's house, I came across a box full of old books. As I rummaged through the books, I came across a book I hadn't seen in years, "La Enciclopedia de Supervivencia de la Naturaleza"...The Encyclopedia of Outdoor Survival. Boy! did that book bring back memories. I remember purchasing that book in Spain when I was about 12 years old. I would not let my aunt leave the store until she bought it for me. It was the resurfacing of that book that sparked a whole new interest in outdoor survival. Once again, I quickly found myself reading anything that I could on outdoor survival.

It was in the summer of '99 that I came across the School Of Self-reliance while surfing the internet. I quickly signed up for one of the classes led by Christopher Nyerges, director of the school. The class was exciting. We learned about many plants, and how they could be used for tools food and medicine. We even made a small salad from some of the plants we collected throughout the day. Towards the end of the outing, Christopher gathered the class and began to demonstrate the bow-drill. I sat there in awe as I saw wisps of smoke come from the hearth and spindle. When he finally made the coal, I was completely

astounded. How is it that you could get fire by rubbing two pieces of wood together?

It was that experience that led me to experiment with the hand-drill and ultimately achieve the ... Six and a half second coal



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Wood Selection

There are two components to the hand-drill. The spindle or drill and the base or hearth.

Not all woods are made alike...

While many different woods can be used, it is important to use ones that will give you the best result. Woods are made up in different densities. They range in degress of soft, medium or hard.

So what does density have to do with the ability to make fire?

Well, if the wood is too hard, such as oak, the ignition point is too high and that means that you will not be able to apply the pressure and speed needed to create dust and ultimately the coal. At best, you will get a little smoke and very fine dust... hardly enough to form a coal.

If the wood is too soft, you will wear the wood down before you have enough time to raise its temperature to its combustion point. Yes, you will get dust, but it will not be hot enough to turn into a coal.

Well then how do you determine if a piece of wood is of the proper density or not?

Well if you don't have a way of measuring the density with sophisticated equipment, you can always use the tried and true thumbnail test. Simply meaning, you take your thumbnail and press it into the wood. If it leaves a nice identifiable mark, then the wood is suitable for use. If it barely leaves a mark or none at all, then the wood is too hard. If it crumbles under the pressure of your thumb or your thumb leaves an impression, then the wood is too soft.

Here are some woods of medium density to help you get started: willow, ash, sycamore, cottonwood, alder, elderberry, mulefat, and cedar.

I personally like using mulefat for the drill and ash for the base.

Don't overlook plants as well. Some make very suitable spindles and bases, as they can be of the proper density.

Make sure your wood is dry!

Finally, one of the most important things to keep in mind is to make sure the wood you use is thoroughly dry. Any amount of moisture in the wood could prevent you from being successful at making a coal. Nothing is more frustrating than getting exhausted using the hand-drill and not being able to get a coal because your wood is wet or damp.

What if it is raining?... what then?

If it's raining and the wood is really wet.

Al I can say is “too bad!”

No not really. There are a couple of things you can do. If you can afford the time, store the wood in a dry place. It should dry out in a couple of days. If time is critical, there is another thing you can do but I will go into more detail once we have assembled our pieces.

Base and Spindle

Spindle

The spindle is the essence of the hand-drill. It is the piece that will spin between the palms of the hands. The spindle is basically just a round straight shaft of wood made from a thin branch or the stalk of some plant.

Is that all there is to a spindle, a round piece of wood?

Well yes and no. Yes it is a round piece of wood, but no it is not just any round piece of wood. The ideal spindle should be as straight as possible, about 24 inches long, and have a tip diameter of about 1/4 to 3/8 of an inch.

Why does size matter?

If the spindle is too long, the top has a tendency to whip around as you're spinning the drill. It may also have a tendency to bend in the middle as you apply pressure. The diameter of the wood is also important because you want to be as efficient as possible when you spin it. I have found that the tip of the hand-drill is most effective when it is about 1/4 to 3/8 of an inch, because it provides the best transfer of energy when you spin it. If the tip is too wide, then the transfer of energy is expanded over a wider area, making it less efficient. If the tip is too small, then there is not enough surface area contact between the drill and hearth to provide you with the dust and friction you need to make a coal. Think of a magnifying glass if you will. It has a point where it is most efficient. If the beam is too wide, it disperses its energy over a wider area. That means it would take a lot more energy to create the heat needed for combustion. The same happens with a piece of wood whose diameter is too big. It disperses its energy over a wider area. When using a magnifying glass, you concentrate the beam into one point to make a fire. The same thing applies to the hand-drill. however, with wood you need surface area contact in order to create friction.

If the drill is too small in diameter, there will not be enough surface area to create friction. If the drill is too big, it will require you to physically work harder

Base

The base is the flat piece of wood that sits under the spindle. It is the piece the all-important notch is carved into.

The base should be about 8 inches long, 1 inch wide, and a 1/4 of an inch thick. I try to keep the base at 8 inches in length because it seems to provide enough room for me to get a good solid hold on it with my foot. The 1 inch width gives me enough room to make new notches on the backside of the wood, once I have completely filled up the first side. The thickness is also pretty important. I have found that a 1/4 of an inch thick seems to work best. If it is too thick, it takes longer for the dust to build up. If it is too thin, you will find that you go right through the wood faster than you can get a coal.

It took me a while to figure this one out, but when I finally did, I noticed that the amount of time it took me to get a coal was reduced.

The Notch

The proper notch is important and quite easy to make. I know there are those out there that try to get over technical in the creation of the notch. Some even have figured out a mathematical formula for its proper size. Others suggest you should flare out the bottom in order to get proper air flow.

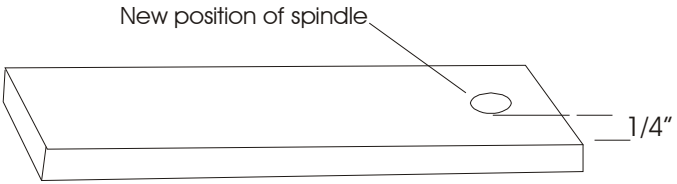
All I have to say is "Bullshit!"

You don't need a formula and it certainly doesn't have to be flared out at the bottom. Now, I am not saying formulas and flares don't work. I am just saying that you shouldn't over complicate it.

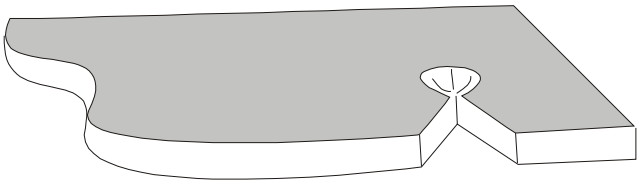
The notch is there to allow the dust that is created by the friction of the two pieces of wood, to accumulate in one location. Without this notch, the dust has nowhere to go and would be smothered by the spindle, along with any hope of making a coal.

How do you make your notch Alan?

First I figure out how far in from the edge of the base the spindle should be. In this case, if the diameter of the tip of the spindle is a 1/4 of an inch, I move in a 1/4 of an inch from the edge of the base towards the center. This new position will be where the edge of the spindle's tip will sit. Once I have figured that out, I give the spindle some spins just so I leave its impression in the base. This will give me a visual reference when I start cutting out the notch. Once I have a nice impression, it is time to work on cutting out the notch.



I normally use a pocket knife to make the notch, but my friend Dude always laughs at me and tells me I should use the small saw on his Swiss Army Knife. He says it would be easier.
I just shrug it off and say "no thanks. It's easier my way"
I really do this just to piss him off.



Take your knife, saw, or whatever is best for you, and cut a v-notch in the wood as illustrated. The opening of the v shouldn't be bigger than about a 1/4 of an inch. It is important that the notch– where the v comes to a point– is not too wide. If that happens the spindle will have a tendency to slip into the notch and prevent you from spinning. The point of the v should come to a point about 1/16 of an inch into the depression where the spindle will be working.

Once you have finished making the v-notch, you are ready to start using the hand-drill.

Using the Hand-drill

The actual mechanics of using the hand-drill are quite simple. You place the drill in the base and spin it between the palms of your hands, until you have a coal.

Sound easy?

Well it is... kind of. You see, while the mechanics are easy, there are certain things you can do that will greatly improve your chances of success.

Speed x Pressure = Coal

Speed and pressure are the two elements that you bring to the table. The human body however, is only capable of spinning the drill so fast. So... in order to make up for our inability to generate enough speed, we have to make up for it with pressure.

I have constantly demonstrated the effects of pressure by considerably slowing down the spinning, while increasing downward pressure. In all cases, I have successfully made a coal even though I have slowed the spinning.

So how do I increase pressure?

Unfortunately, God did not bless us all with the genetics of Hercules. In order to compensate for the lack of upper body strength, we have to make adjustments elsewhere to increase downward pressure. Those adjustments come in the form of body positions.

The right body position is especially important to those that do not have much upper body strength.

There are a few basic positions that most people take when using the hand-drill. The prayer position, the crossed leg position, the bow-drill position, the sitting position, and the squatting position.

The prayer position

This position is basically a kneeling position. If you take a look at where most of the weight of the body is centered over, you will see it is at the rear, on top of the feet.

The crossed leg position

Again look at where the body weight is located... Right behind the leg that is tucked in. Where your butt meats the floor.

The sitting position

This one is similiar to the crossed leg position but the leg is extended out instead of tucked. Again most of the body weight is centered at the point where you are seated.

The squatting position

Although one is off of their butt in this position, one still has their weight centered away from were the action is...

The bow-drill position

So called because this is the position one takes when using the bow-drill. This position spreads ones weight about. the weight is centered over the kneeling and upright legs

The short-stance position

If you start in the bow-drill position but you shorten your stance, you'll notice that you shift your body weight over the center of the action. Notice that I do not sit on my rear leg as that would shift my weight to the rear. Although you can not see it in the picture, the spindle is riding past the left side of my head so I don't accidentally jab myself with the spindle.

Now that we have seen some of the most common positions, lets see how they affect the ability to apply pressure.

Taking an ordinary scale, I placed the hand-drill on it And applied as much downward pressure as possible, while in the various positions. By doing this, I was able to measure the effect that body positions have in relation to pressure.

Position	lbs

Prayer position*	20
Crossed-leg	19
Squatting	23
Sitting	19
Bow-drill	23
Short-stance	31

You can see that the short-stance allows you to apply more downward pressure than all the others. This equates to the ability to produce a coal faster than using the other positions. By doing this, you will also be less fatigued.

* I tried the prayer position also by getting up on my knees instead of sitting on my calves. This small change in position shifted my weight forward, closer to the action. The result: The amount of pressure applied jumped from 20lbs to 30 lbs. This position is great, but doesn't allow you to hold the base under your foot as the short-stance does.

Now that we have seen how a body position plays an important role in increasing pressure, we can go through the mechanics of making a coal using the spindle and base.

Putting the tools to work

Before you get into position, you should place something under the base to catch the coal. You can use a leaf, a piece of paper, or whatever else under the notch of the base. This will facilitate placing the coal in the tinder. You should also have your tinder, kindling, and wood ready to go. The last thing you want to do is run around scrambling for fuel to feed the fire… Always think ahead!

I did not go into the explanation of tinder and kindling. This information can be found in many other places. The purpose of this booklet was to deal with the hand-drill… nothing more, nothing less!

Once all the elements are in place and your ready to go. Get into the short stance position and place the tip of the drill in the base. While applying downward pressure, start spinning the drill between the palms of your hands. You will notice that as you continue spinning, your hands start sliding down the drill. When your hands work themselves to the bottom of the drill, grip the drill with one hand while maintaining downward pressure. Take the other hand and bring it back to the top and re-grip the drill, always maintaining downward pressure. Release the opposing hand and bring it back to the top to meet with the other hand, where you start the spinning all over again. It is important that you maintain downward pressure as you shift your hands back to the top. This will prevent heat from escaping at the point where the drill and base meet. I know it sounds complicated, but with a little practice, All these moves should flow into one smooth action.

As you continue, you will see the wood starts to wear away and dust starts to fill the notch. The dust that fills the notch is what eventually will turn into a coal. At first the dust will come out a light color, similar to the color of the wood. Then you will see the dust turn darker and coarser in texture. you will also notice that you start producing smoke from the base. As the dust continues to heat up, it will start to turn black and smoke will come out in plumes. This is when you should give it your all and really spin hard a couple of more times and stop. If the dust continues to smoke on its own you have successfully made a coal.

I'm tired. I can't go on!

If you get tired before you get a coal, don't worry. Just stop and take a break. However, do not get rid of any accumulated dust. I repeat, do not remove any of the dust. It was hard work to get that dust. The last thing you want to do is start all over.

Once you have taken your break, just pick up where you left off until you get a coal.

Troubleshooting

Polished drill tip

If you find yourself spinning the drill but not producing any smoke, take a look at the tip of the drill. Chances are it has been polished to a nice shiny black tip. If it happens to the tip, then it probably happened to the hole in the base as well. It occurs because you were not applying enough downward pressure to begin with.

So what do I do?

All you need to do is rough up the polished surfaces by scraping them with a knife or whatever else you have. Some people suggest dropping a few granules of sand into the hole in the base. I just assume scrape it off with a knife.

Wet wood

If the wood is wet, you can still use the wood, but it is going to take some work. All you need to do is take a comfortable position and start drilling as you would when trying to start the fire. The big difference is you do it in a nice relaxed manner. Do not do it with extreme pressure. You just want to dry out the wood nice and easy by its own heat, generated from the spinning. Again, this will take some time so have patience. Just keep at it and rest periodically. Once you have done it for a few minutes, try to make a coal. If it doesn't come with ease, like you know it should, then the wood is still wet. At which point, you should continue spinning with nice easy pressure in order to dry the wood.

Blisters

Blisters are a common occurrence when using the hand-drill. The best advice I can give is if you get one, treat it as you would any

other blister. Lay off of the hand-drill until your hands have healed, and then start back up. It will take some time to condition your hands. Just keep it up.

Tips and Tricks

Partners

If you have a partner or a group of people, you might want to try together. This will let you rest as the next person is spinning. All you do is continue as normally would. When you work your way to the bottom of the drill, say “go!”. The next person in line then starts at the top and continues spinning. When that person gets to the bottom, that person says “go!”
So forth and so on, until you get a coal.

Thumb loops

Another trick you can try are thumb loops. Take a shoelace or a piece of twine about 18” long, and tie two loops big enough for your thumbs to fit through on either end. Then make a small slit on top of the drill and center the twine in the slit. Stick your thumbs through the loops-- one thumb per loop– and begin spinning. You will notice that by doing this your hands stay in one place. You can also apply more downward pressure by pulling down on the loops with your thumbs.

Floating

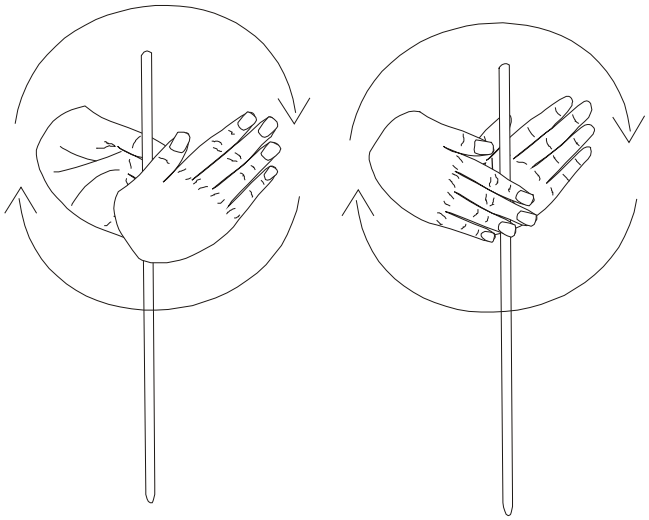
Floating is one of those esoteric skills that is nice to know, but you don't need to have.

Basically, you spin the drill in such away, that your hands don’t slide down the drill while your spinning. In fact, you could even have your hands ride up the drill while your spinning it.

The draw back to floating is it doesn't allow you to apply maximum downward pressure. You primarily use it just to warm up the wood. Once you have warmed up the wood, then you continue as you normally would.

I never use it, but I know how. So for those of you out there that insist on knowing it, here goes.

Start in the position you normally would and begin spinning. However, instead of your hands moving back and forth evenly across each other, move them in small circles with the hands at angles to each other... similar to pedaling a bicycle with your hands. This will definitely take some practice and getting used to.



Never take the ability to make fire for granted.

I was asked to do a segment on survival for a television show. Everything was going great. We made shelter, found water, and scrounged up some wild food. The producer wanted to do a segment on fire making, using different techniques. I showed them how to use a busted out headlight as a parabolic reflector, in order to make a fire. I showed them the magnesium fire-starting tool as well as a few other things. Everything was going flawless. The last thing I wanted to show them was the hand-drill. I picked up my mulefat drill and my alder base, and started going at it. Smoke just started pouring out and I knew I was going to get a coal for sure. After a few turns with the drill, I stopped...but no coal was produced.

"What the $#%^!" ran through my head. "I thought for sure I had it."

I started doing it again. Again I got tons of smoke, but still no coal. By this time, beads of sweat were pouring down my face. I mean, here I am trying to show these people how to survive and I can't even get a coal. The camera was rolling, people were watching, but no coal. After a few more tries of this, I looked up at the producer and said "screw it!"

I pulled out my ferro rod and sent a shower of sparks onto the little dust pile I had made with the hand-drill and immediately got a coal. Without missing a beat, I took the coal put it in some tinder and blew it into a flame.

When the show aired a couple of months later, I sat there glued to the TV, wondering what the hell they were going to show. When the fire scene came up, I started getting nervous, hoping they wouldn't make me look like an idiot. Alas, through the magic of editing they made me look like I knew what the hell I was doing.

Next time I won't be so cocky!

Closing remarks

Making fire with two pieces of wood can be a magical experience. The hand-drill can be frustrating to master, as it requires practice and patience. I assure you that if you follow my instructions, your chances of making a fire will be increased.

There are no set guidelines for using the hand-drill. Many people use a lot of the postures that I deemed inefficient. But hey! If it works, then so what. Anything that works is worth using. Try different combinations of wood for instance. Try using plants for your tools. In a real world scenario, anything goes. Do not limit yourself to the things you have learned here. Experiment.

I know of a few people that are set on doing it their way because that is the way they were taught. Yet time and time again, they are unsuccessful in their endeavors. In a survival situation, those people will be the ones getting extracted in body bags because they were afraid to think out of the box and experiment.

Lastly, always have several ways of making a fire. You might be surprised as to how the cold has a way of limiting your coordination. Even the simplest of tasks can be challenging.

Remember, in a survival situation, there are two possible options... Success or Failure.

In my book...

“Failure is not an option!”