

# How to Use a Simington #451C Chain Grinder



A Simington #451C square-chisel saw-chain grinder mounted on its stand.

## Using the #451C for the First Time

### Assembly

If your grinder is not assembled you will need to mount it on its stand before you can use it. To begin, identify the three-legged base and main support tube. Place the main tube in the center of the base. Lift the stand tube a few inches from the floor and tighten the holding bolts. Later, you may wish to adjust the height, but for now, set it here.

Once the stand is assembled, remove the grinder from the box. Place the round receiver in the grinder's chassis over the top of the main support tube. You may have to loosen a set-screw for this to slip down all the way. You should be able to see the top of the stand tube resting on the stops that are cast into the top of the receiver.

Next, position the grinder over one of the stand legs. This will make the grinder less prone to being tipped over. Once it is in place, tighten the set-screw to hold it there.

Now, install the feed-stops and diamond-dressers as shown in the above photo. Last, drop the plug-in end of the power cord through the top opening in the tube. Feed it through the tube and out the bottom. This protects the cord and keeps it out of your way when you are using your grinder.

### Before You Begin

Before you use any grinder, put on safety glasses. You never want grinding dust or hot metal sparks in your eyes. Safety glasses can also protect you from flying debris should a grinding wheel break. This doesn't happen often, but a cracked wheel may fly apart when you turn the motor on. This may occur after the grinder was tipped over or as the result of rough treatment during transport. It can also happen after a new grinding wheel is installed.

If you have difficulty seeing fine-detail, wear safety glasses with built-in corrective lenses. Regular reading glasses will work, but be sure to wear safety glasses over them. The Simington #451C is a precision grinder and the work you will be doing requires clear vision up-close. If you can't easily see the corner of the grinding wheel or the corner of a cutter tooth, you will not have consistent results.

Before you plug the grinder's power cord into an outlet, make sure it is turned off. The switch has three positions: On-Off-On. Make sure it is in the off position. If using an extension cord make sure the wire in it is 12-gauge wire or heavier and the cord is grounded. Also, don't use an extension cord over 50' long.

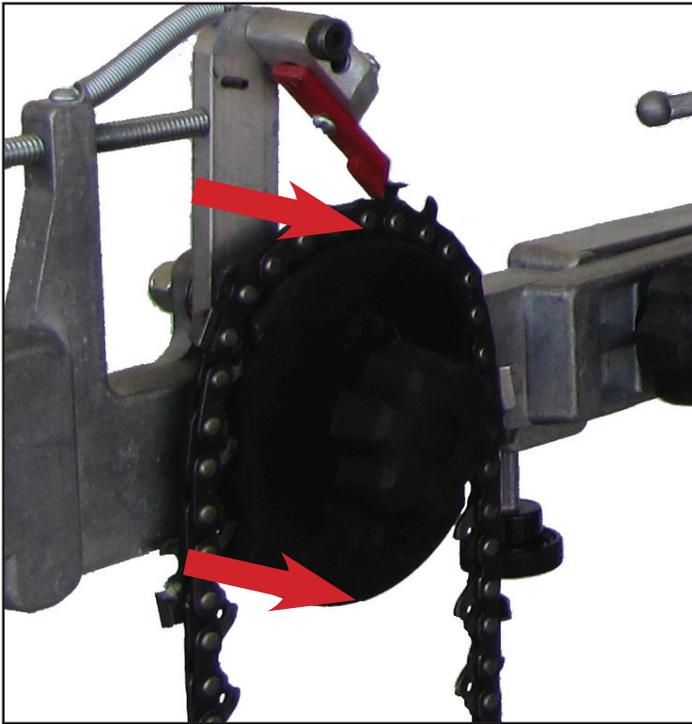
Always use and store the grinder in a covered area. It is not weatherproof and not designed to be exposed to the elements. When powering the grinder with a generator on a remote site, make sure the generator is large enough to run the grinder along with all the other things that are connected to it in your camp. A generator that does not deliver adequate power will damage the grinder's motor.

Good light helps all operators see details up-close. Take a moment to adjust the work-light to highlight the cutter-tooth and the corner in the grinding wheel. The light is mounted on a flexible arm so it can easily be positioned to brighten the work area from any vantage point.

Next, check the area around the grinder for combustibles. A nearby saw engine with a leaking fuel vent could catch fire if a hot spark from your grinder were to ignite it. Also clear out children, dogs, and other bystanders who do not have proper eye protection or are a distraction.

### The Grinding Wheel

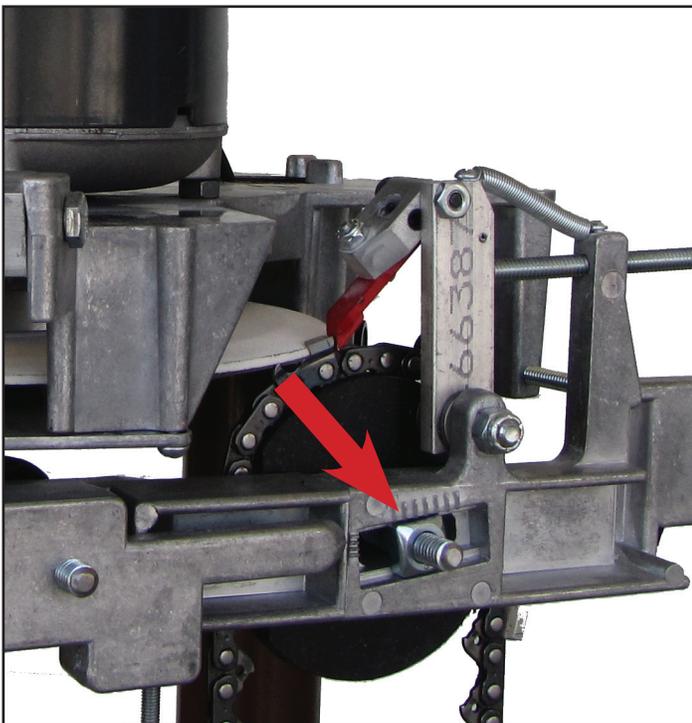
If your grinder is brand new, the grinding wheel should be ready-to-use. We will assume it is in good condition and freshly dressed and shaped. If it is not, or if you are unsure of its condition, go to the section on Grinding Wheel Care before you proceed to the next step.



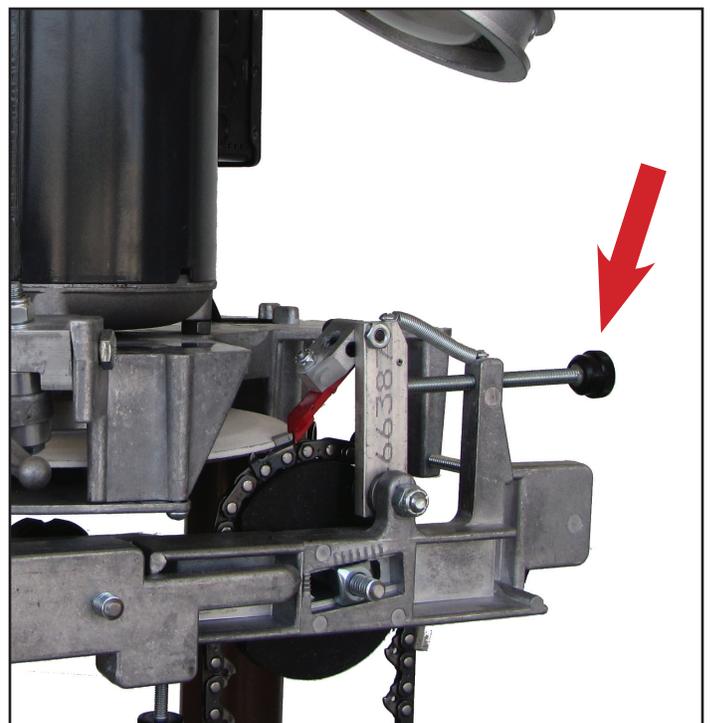
This disk has a .050" groove on one end and a .063" groove on the other. This groove must match the gauge of the drive-links on the chain you intend to sharpen. Adjust the disk so the groove you want is on top and its flat sides tilted a little forward from vertical.



Before you turn the motor on, make sure nothing is touching the grinding wheel. Notice the corner of the wheel is aligned with the outside corner in the cutter-tooth. This is what you need to accomplish.



Position this adjustment in the middle of its travel.



Use this adjustment to align the corner in the cutter-tooth with the corner in the grinding wheel.

### Locate & Adjust the Chain Guide

Locate the chain guide. It is a black disk-shaped object with two rounded surfaces and two flat edges. The rounded surfaces have grooves in them that a chain's drive-links fit into. One side of this disk has a .050" groove and the other is a .063" groove. This groove must match the thickness of the drive-links on the chain you will be sharpening. If you need to rotate this disk so the groove you need is facing up, loosen the black knob in the center of this disk, rotate it into the proper position, and re-tighten.

When you retighten the black knob, the two flat surfaces on the disk should be tilted a little forward from vertical. This tilt is not critical as the exact position of the disk does not affect the arc the chain sits on.

You may have also noticed the black knob loosens a nut that allows the mount to slide in a slot on the back-side of the arm. For now, make sure this nut is in the middle of its travel and re-tighten. We will tell you more about what this adjustment does later.

### Mounting the Chain

Before you start to sharpen a cutter-tooth, inspect all the cutter-teeth on the chain and identify the shortest one with the most damage. If your chain has been sharpened with a file a time or two, you'll find some teeth are shorter than others. One of your goals is to produce a sharpened chain with all the cutter-teeth at the same length. Since you can't add material to cutter-teeth, you must start with the shortest tooth or you won't be able to make the rest of the teeth match. If your chain has never been sharpened before and doesn't have any "rocked" teeth, all your teeth will be the same length, so you can start anywhere.

Next, mount the chain in the grinder's holding mechanism. Put the chain-stop pawl behind the shortest cutter-tooth. You may have to gently push on the side of the red stop-pawl to pivot the chain-stop so it rests directly behind the cutter-tooth you intend to sharpen.

Before you turn the machine on, adjust the cornering-screw adjuster so the cutter-tooth is close to the grinding wheel. It is the thumb-screw located at the end of the arm. Check to see that the corner of the stone and the corner of the cutter-tooth are aligned. If they are not, re-adjust. Also, check to be sure that nothing is touching the grinding wheel, because you are about to turn the motor on.

### Two-Directional Motor

Your chisel grinder has a two-directional motor. This means the grinding wheel can spin in either direction. When sharpening square-chisel chain, you always want the grinding wheel to rotate into the cutter-tooth it is sharpening. By sharpening with the wheel spinning into the cutter tooth, no grinding burr will form on the outside of the cutter-tooth. It is not likely you will make the mistake of grinding with the wheel spinning in the wrong direction more than once, because when it is, it also sends sparks toward the operator!

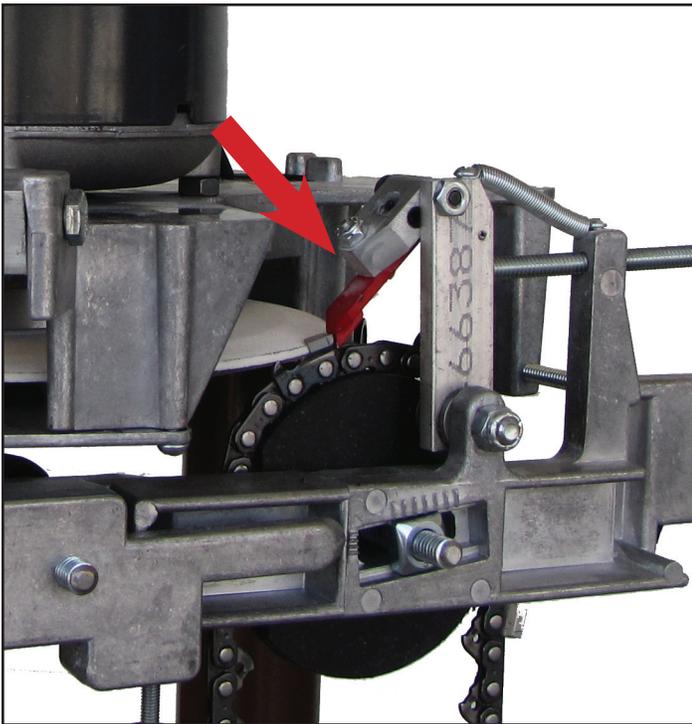
Now, turn the motor on by pulling the switch toward you. The wheel should be spinning in the correct direction. If it is spinning the wrong way, turn the grinder off, let the wheel slow to a stop, and reverse it. Do not try to slow or stop the wheel with your hands, even if you are wearing gloves.

### Corner Alignment

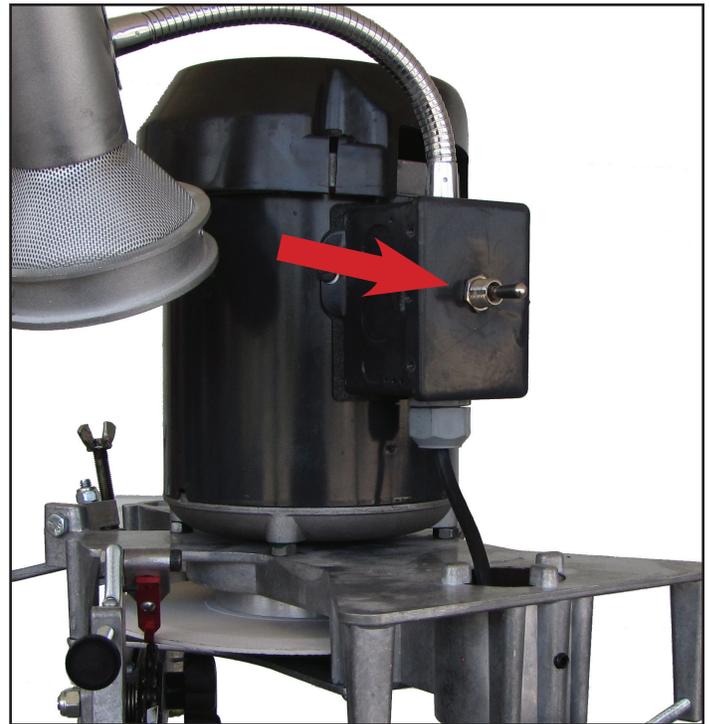
With the wheel spinning, move the arm towards the grinder and gently feed the cutter-tooth into the grinding wheel. Do this in short and gentle motions. Don't try to remove a lot of dull cutter-tooth material in any one motion. Remove dull material slowly, being careful not to over-heat the cutter-tooth in the process.

Also, hold a little back-pressure on the chain with your other hand so the back of the tooth stays in contact with the chain-stop-pawl. As the grinding wheel removes dull cutter-tooth material, watch to be sure the corner of the grinding wheel is aligned with the corner of the cutter-tooth. It is critical these corners align. This is the single most important aspect of sharpening a square-chisel cutter tooth. If these corners are not aligned, adjust the position of the chain-stop-pawl and sharpen again. Repeat until all the dull cutter material has been removed AND the corners are perfectly aligned.

Since the corner in the cutter-tooth slopes down to the rear, the corner you are aiming for will get lower and lower as you grind away dull cutter-tooth material. This isn't a problem unless you must remove a lot of dull material from your cutter-teeth. In this case, you will find it necessary to set the wheel's corner a little below the corner in the cutter-teeth to start with. This will allow you to remove dull steel, and when it is ground away, the corner of the wheel will be perfectly aligned with the corner in the cutter-tooth. It takes some practice to judge how low to make this initial setting, so for now, try to keep the corners aligned.



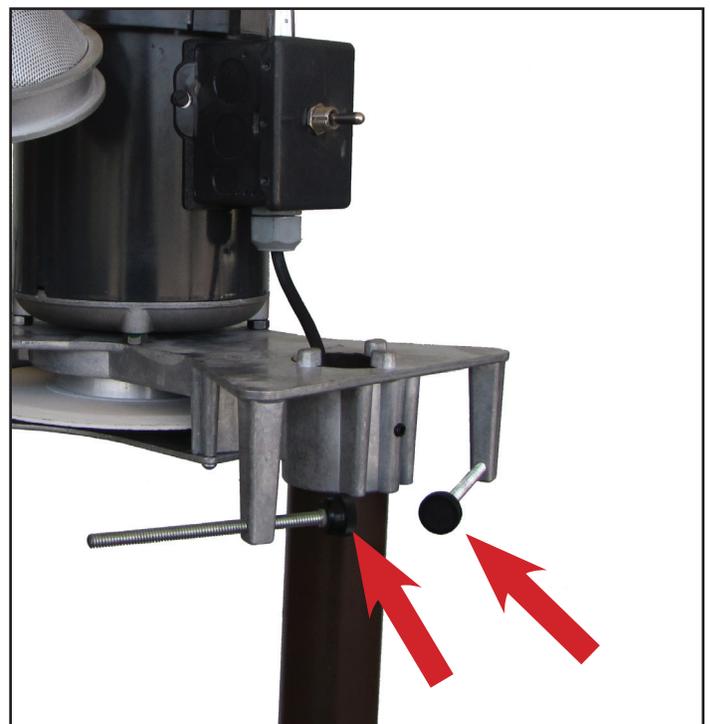
This chain-stop pawl pivots from side to side. Make sure it rests directly behind the cutter-tooth you are sharpening.



The motor will run in either direction. Pull this switch toward the side you wish to sharpen. This should cause the wheel to rotate into the cutter tooth. The switch has three positions: on-off-on.



Swing the arm around to the other side when all the cutter-teeth on one side are sharp. This will allow you to sharpen the cutter-teeth on the other side.



These are the feed stops. When set correctly, they allow you to grind all the cutter-teeth on both sides to the same length. This is important for a chain to cut straight.

### Sharpen Back to Clean Chrome

The silver metal finish on the outside of cutter-teeth is chrome plating. This chrome “crust” is harder than the steel cutter-teeth are made of. Its purpose is to reinforce the corner in cutter-teeth and make all the sharp edges more durable.

When a chain is slightly dull, you won't have to remove much material for your sharp edges to be formed where the chrome is in good shape. However, if cutter-teeth have severe damage or if a chain has been run dull for a while, the chrome may be worn back. When this occurs, more cutter-tooth material must be removed. This may seem like excessive grinding, but cutter-teeth will not perform well if their sharp edges are not ground back into clean chrome plating.

### Inspect Your First Cutter Tooth

Now that you have sharpened one cutter-tooth, turn the grinder off and remove the chain to admire your work. While you are looking at your accomplishment, closely examine the corner in the cutter-tooth. Look for any type of misalignment. If you see some, these are called beaks. If you see evidence of misalignment, remount the chain and re-sharpen the cutter-tooth until the corners are perfectly aligned. We will cover more about beaks in a minute.

### Setting the Feed Stop Helps Duplicate Cutter-Teeth

Once you have a sharp cutter-tooth, your next job is to duplicate this grind on all the rest of the cutter-teeth. This is a lot easier than it sounds. Not only is a grinder powered by electricity, but it has feed stops that limit travel. These stops make it easy to duplicate the angles and length of each tooth exactly. What is hard to do with a file is super-easy with a chisel grinder. So with your sharp tooth still indexed, adjust the feed stop to limit swing travel so no more can be ground from this tooth.

Next, raise the stop-pawl and move to the next tooth on the same side. This means you will be going past a cutter-tooth that is on the other side of the chain. Once the new tooth is in place, check to be sure its corner is aligned with the corner in the grinding wheel, just like you did before. It may not need any adjustment, but if it does, it will be very little. When the alignment is right, grind it back to the stop. This should produce a cutter-tooth that is identical to the first one you ground.

Now you have two sharp cutter-teeth that are identical. If everything looks good, move to the next tooth and repeat. Once you've ground several teeth that look good, you are on your way. It is easy to make all the rest of the teeth on this side of the chain match each other perfectly. During this process, you should only set the feed-stop once, but you may have to make slight adjustments in corner height to keep the corners aligned. This is normal.

### Switching Sides

Once all the cutter-teeth are sharpened on one side, turn the motor off. Allow the wheel to stop, then swing the arm over to the other side.

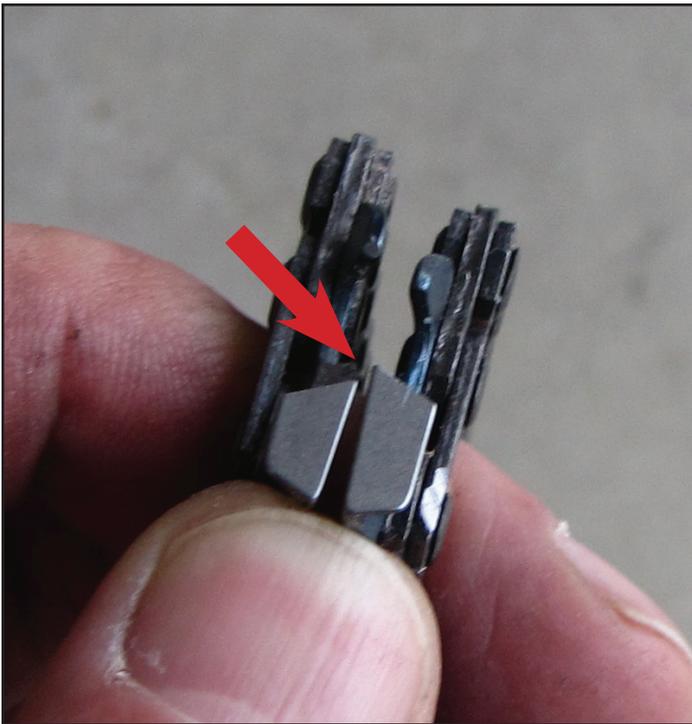
Now, pivot the red chain-stop-pawl to its other side. It should now rest directly behind a cutter-tooth on the other side of the chain. This can be any cutter-tooth since all of these teeth are longer than the ones you've already sharpened. Make sure the grinding wheel is not touching anything before you turn the motor back on. When you have determined it is all clear, turn the motor back on by moving the switch to the opposite position to where it was when you ground the cutters on the first side. In this position, the motor will be rotating in the opposite direction. This is appropriate for sharpening cutter-teeth on this side.

Begin to sharpen a cutter-tooth like you did when you ground the first tooth on the other side. Pay special attention to corner alignment. If the grinder is properly set up, it shouldn't require much adjustment. When the first tooth is sharp, measure its length. It may be a little longer than the teeth on the other side. If it is, grind a little more until it is the same length as the cutter-teeth on the first side. When it is exactly the same size, set the feed-stop on this side.

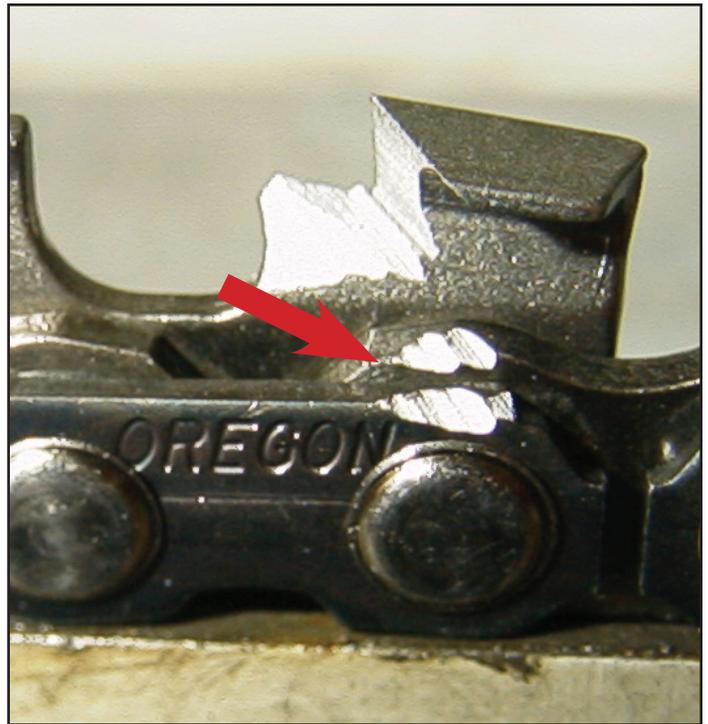
If you don't have a micrometer to measure tooth-length, remove the chain from the grinder and hold the chain in a manner that allows you to do a side-by-side comparison of the cutter-tooth you just sharpened to any cutter-tooth on the other side. You can compare to any tooth on the other side because they will all be the same. Adjust the feed-stop as necessary so the sharp cutter-tooth on this side matches the length of those on the first side.

Once the feed stop is set on the second side, go ahead and grind the remaining cutter-teeth. When you finish, all the cutter-teeth on both sides of the chain should be sharp and the same length.

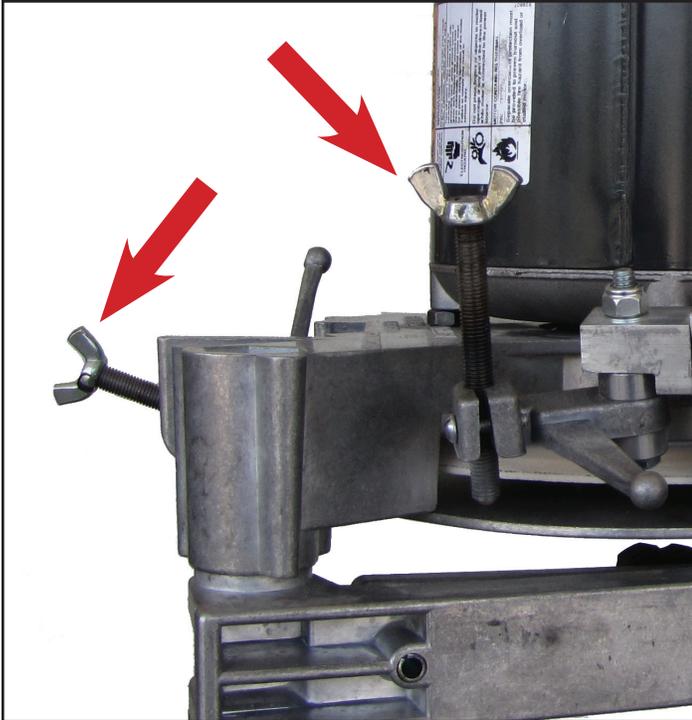
Congratulations, you now have a square-chisel chain with sharp cutter-teeth.



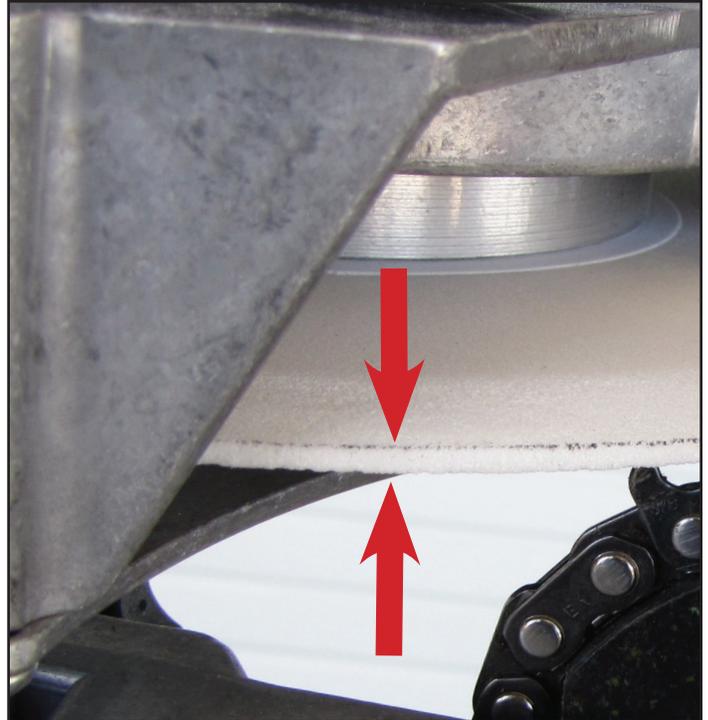
If you don't have a micrometer to measure the length of cutter-teeth, this is an effective way of comparing right side cutters to those on the left. This helps you set the feed-stops so all cutters will be the same length after sharpening.



If the edge-thickness of the grinding wheel is too great and/or the grinder is not set up correctly, the chassis of the cutter-teeth can be damaged during sharpening.



These are the diamond-tipped dressers. They are what produce the shape and grinding surface on the grinding wheel.



The edge of the grinding wheel should be about  $\frac{3}{32}$ " thick, but this is not an exact measurement. It can change based on the profile of the chain you are sharpening. For example:  $\frac{3}{4}$ " chain is taller than  $\frac{3}{8}$ " making it necessary to run a little more edge thickness when sharpening this chain.

### Sharp Chain, But More Care is Needed

Before you put this chain on a saw and make a test cut, check to see if additional chain maintenance is necessary:

1) Gullets. These should be no longer than an eighth of an inch (.125"). These are removed in a separate operation with a file or grinder.

2) Depth-Gauges. These should be set at about twenty-five thousandths of an inch (.025"). For information on the specific depth-gauge settings for your chain, see the manufacturer's recommendations.

Your Simington grinder is not designed to remove gullets or cut depth-gauges, but a freshly sharpened square-ground chain will not perform well if these are not also cared for.

## Grinding Wheel Care

### How to Dress a Grinding Wheel

Grinding wheels are dressed for two reasons. First, dressing shapes the wheel and creates the corner that is so important to square-chisel grinding. Second, dressing sharpens the surface of the grinding wheel.

Like any cutting tool, a grinding wheel becomes dull with use. This occurs when the abrasive on its surface loses its sharp edges. If you are just learning to grind, you will soon notice a dark ring that forms around the perimeter of the grinding wheel. As this ring darkens, you will find it becomes more difficult to sharpen teeth without getting them hot. What causes this? The answer is: dull abrasive. A dull grinding wheel sharpens saw-chain about as well as dull saw-chain cuts wood -- not very well.

At the risk of oversimplification, a grinding wheel is composed of two things: a sand-like abrasive and a bonding material (glue) that holds the abrasive together in the shape of a grinding wheel. The grit on the wheel's surface is the abrasive that grinds away the dull cutter-tooth steel, and it is this abrasive that becomes dull.

To sharpen a dull grinding wheel, you simply remove the top layer of abrasive. This is easily done with the diamond-tipped dressers. Diamonds on the ends of dresser-shafts break the bond (and sometimes the abrasive grain itself). This removes the dull surface abrasive and exposes sharp abrasive underneath it, creating a fresh new grinding surface.

In addition to removing dull abrasive, dressing also restores the shape of the grinding surface. A chisel grinder has two diamond-dressers. Each pivots on a mounting block and cuts the wheel on a single plane. These planes meet near the edge of the grinding wheel, creating a shoulder or corner on the wheel's surface. This corner is important, because this is what forms the corner in a square-chisel cutter-tooth.

### Grinding Wheel Side Thickness

The shape of the grinding wheel is predetermined by the path of the diamond dressers. So, a new grinder operator doesn't have to worry about not getting the angles right. The only control you have is how thick a grinding wheel is on its perimeter. This thickness should be around 3/32".

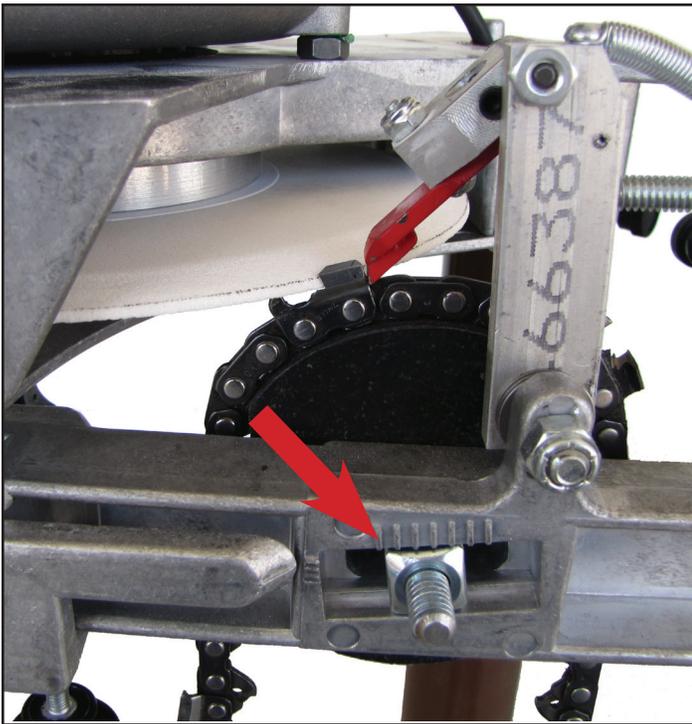
This is not an exact measurement and this thickness can vary a little depending on what type a chain is being ground. Higher profile cutter teeth, like those on .404" pitch saw chain should be ground with a thicker outer edge. Lower profile chain, like 3/8" pitch chain should be ground with an edge closer to 3/32". If you are just learning to use the grinder, stick with the 3/32" measurement for now.

### Wheel Dressing Tips

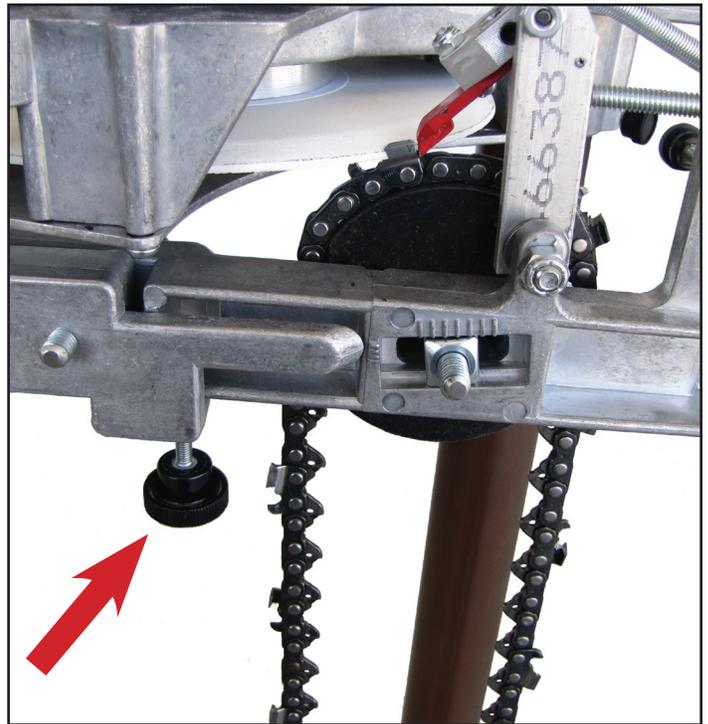
It is a good practice to dress the wheel when it is spinning away from the dresser. When the wheel spins towards the dresser, the dresser arm may load and cause "chatter." Chatter may damage both the wheel surface and its shape. When dressing the wheel, it is also better to make a number of light passes than a few heavy passes. This is easier on the dressers and usually makes for a smoother wheel surface, too.

In addition to dressing with the wheel spinning away from the dresser, start to dress the wheel at its corner and work away from it. The reason for this is the corner of the grinding wheel can become damaged by a dresser unloading as it travels over the wheel's edge.

It is also a good idea to put a slight initial load in the dressing arm before it contacts the wheel. This makes for smooth engagement and improved corner shape. A grinding wheel that is not well shaped will not form good corners in square-chisel cutter-teeth.



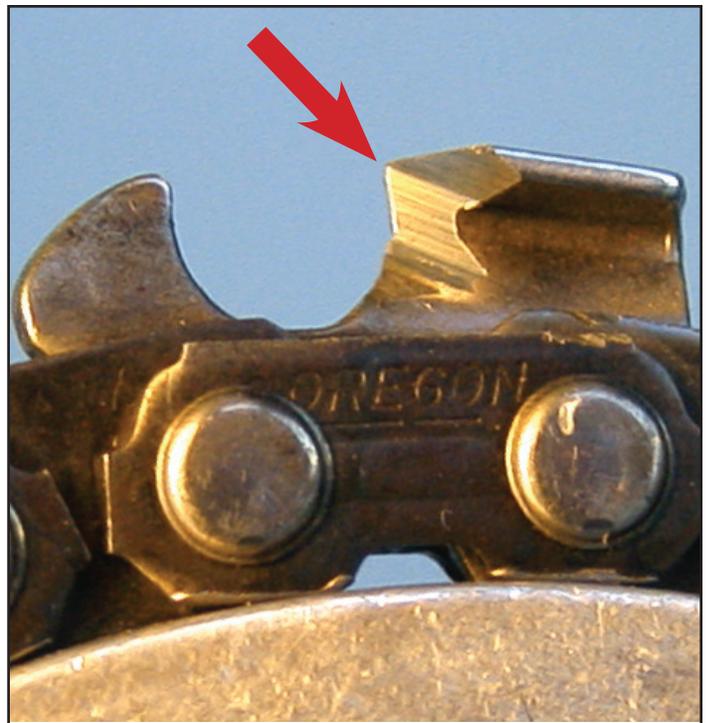
This adjustment is for making sharper or blunter inside cutting angles on your cutter teeth. If you are just learning to use the grinder, set the adjustment in the middle of its travel.



Use this adjustment to raise or lower the chain-holding disk. This will allow you to avoid cutting into the chain's chassis under the hood of the cutter-tooth. This adjustment also affects the cutter-tooth's inside-top-plate angle. Using this adjustment can help you grind similar angles in both new and well-worn cutter-teeth.



When dressing the wheel, it should rotate away from the dressers to avoid loading the dresser arms.



Getting proper corner alignment is the secret to well performing square-chisel saw chain. It is the single biggest factor affecting cutting performance. The corner alignment on this cutter-tooth is perfect.

### Tips on Grinding Technique

#### More on Corner Alignment

People who sharpen with a file almost always cut a side-beak in the cutter-teeth. They do this because it is so difficult to align the outside corner in the cutter-tooth with the corner on the file. Since they never want to cut a top-beak, they position the file to cut a little low, producing a side-beak in most cutter-teeth. A cutter-tooth with a side-beak will still cut well, but a beak is a weak corner that has poor stay-sharp-ability. This is one of the reasons why ground chains usually stay sharp longer than filed chains. Good corner alignment is much easier to achieve with a grinder and this makes for cutter-teeth that cut well and stay sharp, too.

While it is easier to obtain good corner alignment with a chisel grinder, corners can still be misaligned. Every operation needs some margin for error and chisel grinding is no different. Take a hint from those who file and set your grinder a little low if there is any doubt your corners are not perfectly aligned. If you end up with few teeth with slight side-beaks, your chain will still cut great. It just won't hold its sharp edge as long as it would have had it been cornered more accurately. Ignore this advice and your error may produce high corners or top-beaks in some cutter-teeth. Teeth with top-beaks will hardly cut. If you put a sharp chain on your saw and after making a cut, wonder if it is on backwards, look for top-beaks.

#### More on Overheating Cutter Teeth

Compared to grinding wheels used on round grinders, chisel wheels are usually made of finer grit abrasive. Add to this, chisel wheels usually also have a more durable bond. While this helps the wheel keep its dressed shape it also tends to hold dull abrasive on the grinding wheel's surface longer than what typically occurs on wheels used on a round grinder. Both these characteristics make it easier to over-heat cutter-teeth when grinding with a square-grinder than it is on a round grinder. This is a serious problem, because overheating damages cutter-teeth.

There are several things a grinder operator can do to keep from doing this. The first is to grind in small amounts. Slowly pulse the feed arm, letting the tooth cool between pulses. This strategy is much like pumping the brakes on a truck while descending a long hill. A long slow drag creates more heat. The principle is the same with grinding chisel cutter-teeth. It works best to gently remove material in short pulses.

Another practice that aids in keeping cutter-teeth cool is to frequently dress the grinding wheel. A grinding wheel with dull surface abrasive creates more friction and heat than a wheel with fresh sharp abrasive. Frequent dressing also helps maintain a crisp corner in the grinding wheel. This makes for sharp working corners in cutter-teeth.

#### How to Sharpen Super-Dull Chains

Most pro saw users who run chisel saw-chain swap out the chain on their saw with a freshly ground chain when it starts to become dull. This is a good practice because the sharp edges on cutter-teeth are easy to restore when they are lightly-dull. But, sometimes contact with the ground or unseen debris causes severe damage that can not be avoided. When sharpening a "rocked" chain, it is best to remove the damage in a series of passes, rather than all at once. This allows cutter-teeth to cool and reduces the likelihood of overheating them.

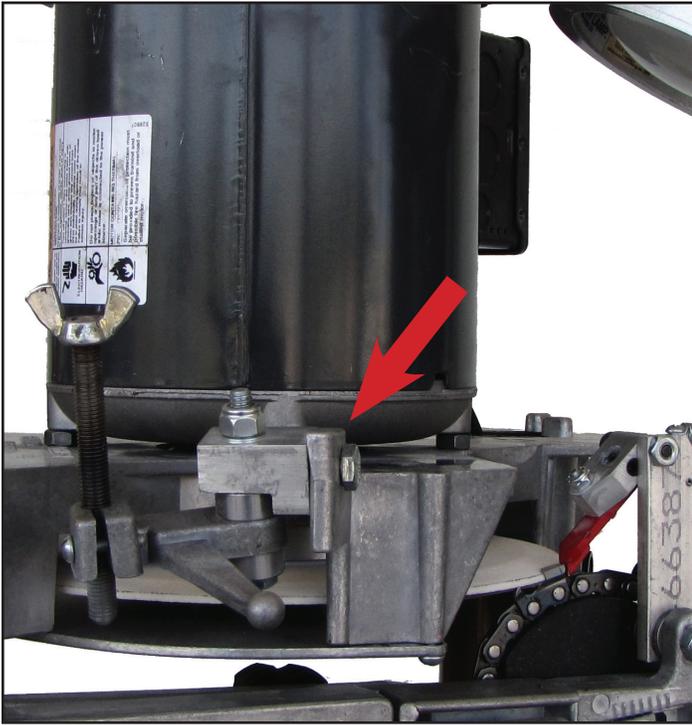
### Tuning Your #451C

#### How to Adjust the Inside-Angles

The inside-angles your grinder produces on cutter-teeth affect both how efficiently the cutter-teeth sever wood fiber and their ability to stay-sharp. In simple terms, acute angles cut wood fiber most efficiently, but they make for weak cutting edges. The opposite is true for stay-sharp ability. Blunter angles works best here. So, the best setup is one that produces inside angles that balance these characteristics; one that produces cutter-teeth that cut efficiently AND still have reasonable stay-sharp ability.

Once your grinder is setup to produce the kind of cutter-teeth you are looking for, you may not retune it for a long time. However, at some point you may choose to make some changes. Why would you ever change a good setup? Well, you may find yourself working in a patch of easy-to-cut wood like Red Alder. Here you may wish to grind slightly more acute inside angles to improve your chain's cutting speed.

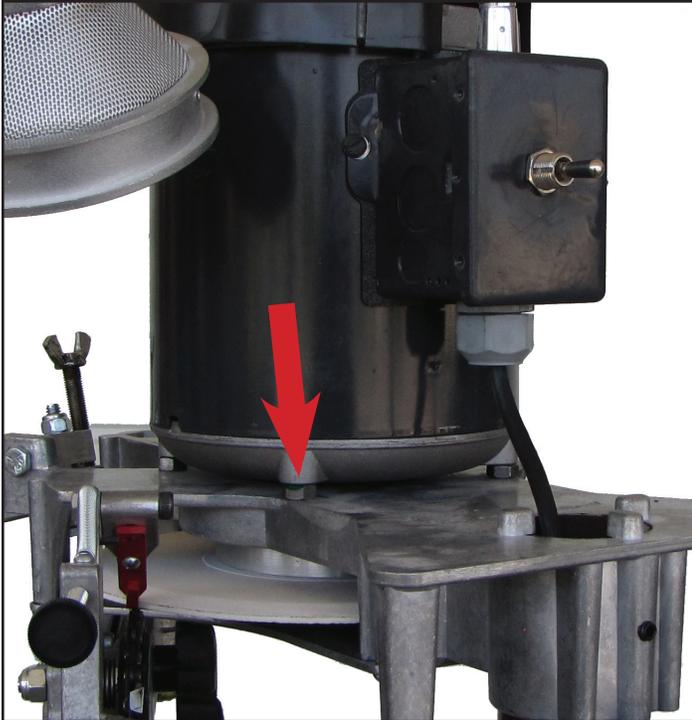
On the other hand, it might be the middle of winter and you are on a job cutting frozen wood. Here you may wish to change your setup to one that produces blunter cutting angles to improve your chain's stay-sharp ability. Yet another reason to retune might be that you have decided to enter a cutting contest at a local logging show. For racing, you'll want a setup that grinds very acute cutting angles.



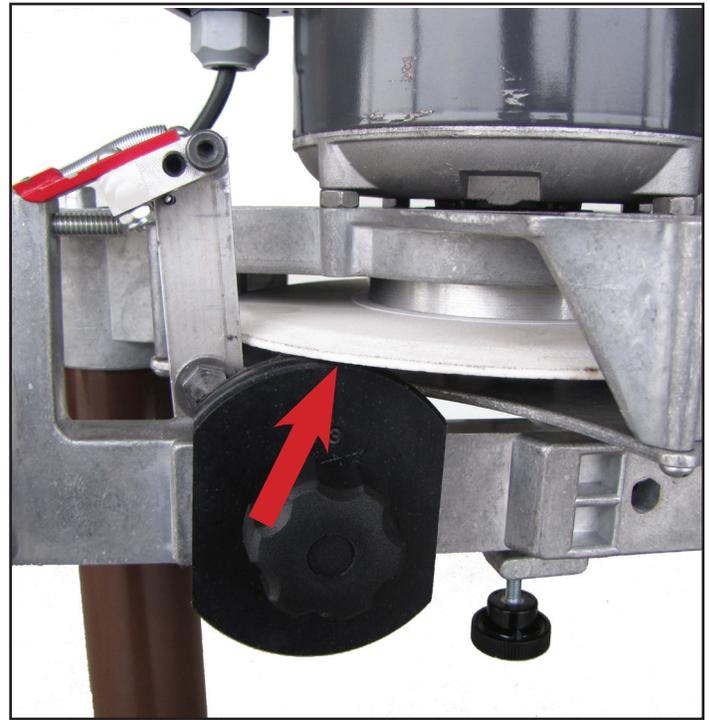
To change the shape of the grinding wheel, you must change the path of the wheel dressers. You do that by pivoting the dresser mounting blocks where they attach to the grinder's chassis.



These grooves in this disk are .050" on one side and .063" on the other. Position the groove that matches your chain up. It can tilt slightly forward like this one if you wish. The exact position does not affect the grind angles.



This is one of four motor-mount posts that can be shimmed to match the plane of the wheel to the sweep of the swing-arm. These planes need to match or the grinder will not produce similar angles on right-hand and left-hand cutter-teeth.



To check if the plane of the wheel matches the sweep of the swing-arm, back off the feed-stops and adjust the arm height so the chain holding disk just fits under the grinding wheel. Then swing the arm over to the other side and measure if there is a difference.

The adjustment that affects the inside angle the most is the arm length adjustment. The arm doesn't actually get longer or shorter, but there is an adjustment that moves the chain's mounting disk forward or backward on the arm. This causes cutter-teeth to contact the grinding wheel at a different location. The affect is, when you move the disk to a back position, it will make the inside angle on your cutter-teeth more blunt. When you move it forward, it will make this angle more acute. For now, set this adjustment in the middle of its travel. This is a good starting point for most users.

### How to Keep From Cutting Into the Side-Straps Under the Cutter's Hood

There are actually two adjustments that control whether or not you grind into the chain's chassis. The first is the thumb-screw on the underside of the swing-arm. This adjuster raises or lowers the chain's mounting disk. The height of this disk affects the angle of the chain's top-plate relative to the grinding wheel. If this sounds complicated, a better way to describe it is: the height of this disk affects where the chain sits on the disk when it is being ground. Towards the top of the disk, the angle is slight, but as the cutter-tooth moves down the arc from the top, this angle increases. When the angle gets too great, the grinding wheel cuts into the chain's side straps.

This adjustment also affects the inside top-plate angle, which changes as the length of cutter-teeth become shorter. Here's what happens: when grinding a new tooth, the chain will sit on the mounting disk at very slight angle to the grinding wheel. But on a worn chain, short cutter-teeth sit farther down the arc on the disk. This causes the inside top-plate angle to decrease.

This is somewhat of an advanced concept, so if you are still trying to get a good baseline setup, don't worry about it. However, if you are an advanced user and have wondered why the grind changes as cutter-teeth wear down, this explains it. If you choose to compensate for it, you can raise or lower the chain holding mechanism, which changes the inside top-plate angle.

### Adjusting the Dresser's Paths

You already know the dressers are used for cleaning dull abrasive material from a grinding wheel. You also use the dressers to restore the corner in the grinding wheel and to control the thickness of the edge of the wheel. You adjust the "wing" nuts on the dresser shafts to move the dressers in or out. This is all part of basic grinder operation, but there is more tuning you can do with the dressers, and that is done by changing their paths.

Since the grinding wheel is ultimately what shapes the face of your chain's cutter teeth, its shape has a big affect on your set up. So if you wish to change its shape, you must change the path of the dressers that shape it. To do this, loosen a bolt that mounts a dresser block to the grinder housing. Then pivot the block and retighten the mounting bolt.

Why would you want to do this? Let's say your current setup grinds the outside side-plate angle almost perpendicular to the top-plate on your cutter-teeth. You read information that says you should have a slight back-slope. You decide you want to try this, so you pivot the block of the dresser that cuts the outside edge of the grinding wheel. You tilt the block a little towards the motor, tighten it back up, and redress the wheel. Now the wheel has a slightly different shape; it flares out more at its base. Next, you test the new wheel shape by grinding a tooth on an old chain to test your change. Perfect -- the back-slope is just what you were looking for.

Yes, this is a little complicated. It may not be something you want to do if you are working on a baseline setup. However, if you are an experienced grinder operator or have help from someone who is, here is more advice about making adjustments to the dresser's paths:

- 1) If you are going to change the wheel's shape, make a small change, redress the wheel, and then test grind. A small change in a dresser's path can make a big difference, so do it in small amounts.

- 2) Mark the dresser block's starting position. You can do this permanently by etching the outline of a dresser block in the main grinder housing with a metal scribe. For a less permanent mark, outline the dresser block with a fine-point felt-tip marking pen. These marks are important because they will allow you to go back to where you started from if you don't like the changes you make. There is nothing more frustrating than trying to make a small tuning improvement and ending up with a worse set-up than when you started. You always want to have enough marks and notes to get "home."

- 3) Remember the shape of the grinding wheel is a "negative," so think about how you want to reshape the cutter teeth, then do the opposite to the wheel's shape.



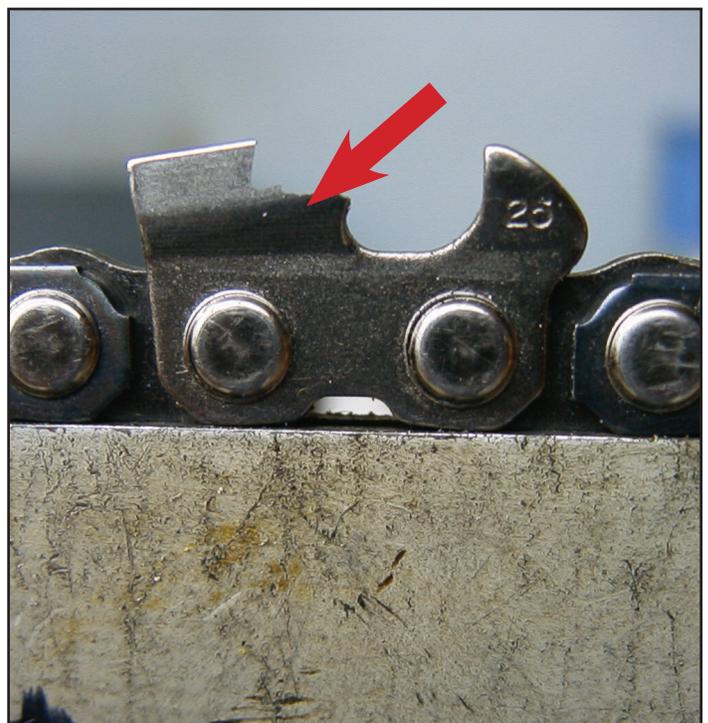
Feed the power-cord down the top of the stand-post. This keeps the power-cord out-of-the-way of the grinding operation.



As cutter-teeth become shorter, it is necessary to advance to red stop-pawl to achieve corner alignment. As a consequence, the cutter sits further down the arc, and the inside-top-plate angle becomes more blunt. To compensate for this, the arm holding the chain-guide can be set lower when sharpening chains with short cutter-teeth.



The gullet on this cutter-tooth has been ground out. Gullets can be removed with a round grinder or round file. The Simington #451C does not remove gullets, but they need to be removed for a sharp square-chisel chain to perform well.



A sharp chain won't perform well unless the gullet is maintained to less than 1/8". This gullet is too long and needs to be removed.

### How to Get Similar Angles on Left and Right Cutter Teeth

Sometimes a grinder will not grind the same angles on the left-hand cutter-teeth as it does to those on the right. This can be the result of a grinder being tipped over or rough treatment during transport. It can also be caused by an operator with bad tuning skills. Whatever the the problem, as long as there are no bent or broken parts, the problem can usually be fixed by shimming the motor. Shimming is how the plane of the wheel is matched to the sweep of the swing-arm.

To measure if shimming is necessary -- and if so, how much, start by removing the chain from the chain guide. Next, swing the arm to either side. Back off the feed-stops so the black plastic chain guide will go under the grinding wheel. With the thumb-screw on the bottom side of the swing-arm, adjust the height so the chain holder just touches the underside of the grinding wheel. With a pencil, mark the wheel where the chain holder touches it. Next, swing the arm over to the other side and rotate the wheel so the mark is over the chain holder. If the chain holder does not touch the wheel in the same manner as it did on the other side, you need to either add or remove shims from the motor mount. You can use thin washers or shim stock to shim between the motor and its mount on the main housing.

Before you begin shimming, know that the amount of shim material you add (or subtract) to the base may have a greater affect than you think because it tilts the motor. When you add a shim to one side of the base, the shim will raise the wheel, but remember that at the same time, it will lower the wheel on the other side. So do this carefully. If you make reckless changes, you may find yourself chasing your tail. Take good notes, shim in small increments, and measure often. It may take a few attempts to get it right, so be patient.

Another thing that can affect the grinders ability to reproduce the same angles on both sides of the chain is the fit of the chain in the black plastic holding disk. On most grinders, this disk has a .050" groove in one side and a .063" groove on the other. If you are grinding .050" chain and using the .063" groove by mistake, the chain will be loose in the groove. When it is loose, the grinder may produce inconsistent angles. It is important to grind .050" gauge chain in the .050" groove and .063" gauge chain in the .063" groove.

### How to Remove the Gullet During Sharpening

Grinder operators have been trying to do this for decades, but unfortunately, it can't be done. Some grinder operators still try, but they end up cutting into the chassis under the cutter's hood in the process. Many try all sorts of things to duplicate a factory-style grind. On a factory grind, the edge of the grinding wheel they use is clearly super-wide, but the factory has one advantage you don't. Manufacturers sharpen cutter-teeth before they assemble the chain, so the tie-strap you damage when you try to duplicate their grind was not there when they did it!

## Grinder Maintenance

### Lubrication & Cleaning

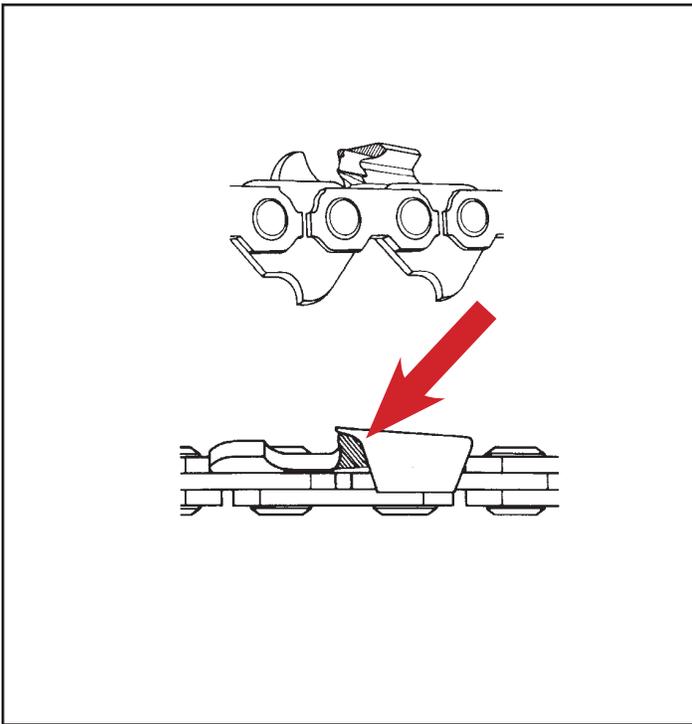
The grinder should be cleaned from time to time to keep it in top working order. A brush and a vacuum work best for this purpose. Cleaning with compressed air should be avoided as it tends to force dust deep into parts like the motor and switch. Since this dust is made up of bits of abrasive material from the grinding wheel and steel dust from cutter-teeth, it is both abrasive and conductive. This is not good for electrical components or moving parts.

The only lubrication that's necessary is occasional lubrication of the bearings in the pivot of the swing-arm. A light grease or oil should be applied to them in a sparing manner. Any lubricant left on the outside of the arm or housing will attract grinding dust.

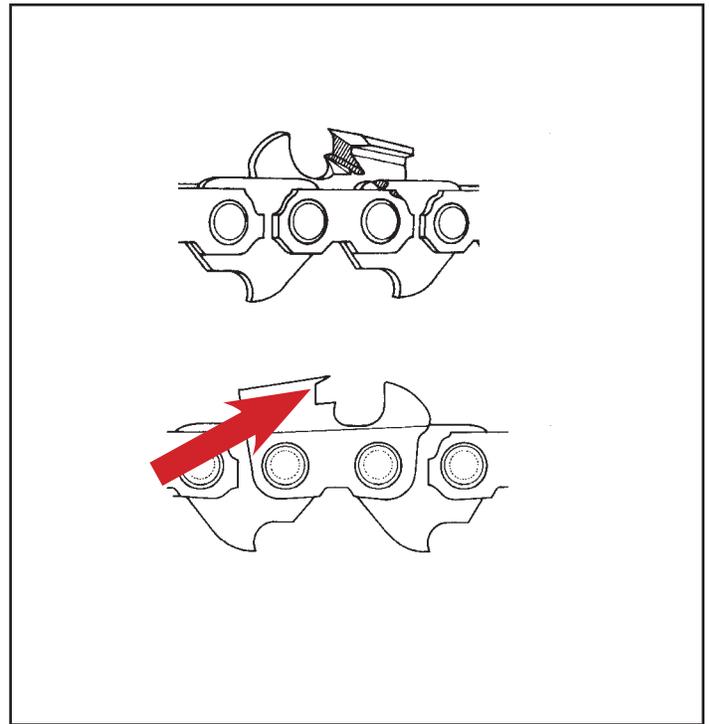
It's also a good idea to occasionally check the fasteners on the grinder and to tighten anything that's loose. The dresser mounts should be kept snug as should the arms that hold the dressers themselves. If these become loose, the dressers may not produce a smooth surface on the grinding wheel.

### When to Replace the Grinding Wheel

New grinder operators are usually surprised when it comes time to replace their first grinding wheel. Some even think something is wrong with their grinder when the wheel wears to a diameter of 6 3/4" or so. Admittedly, a wheel of this size still looks like there is a lot of grinding wheel left to use, but it won't grind well. Although you can use a grinding wheel as long as the chain can still reach it, you will replace it long before this. The reason is, a small change in the wheel's diameter makes a big change in it's circumference. A shrinking circumference slows the speed on its perimeter.



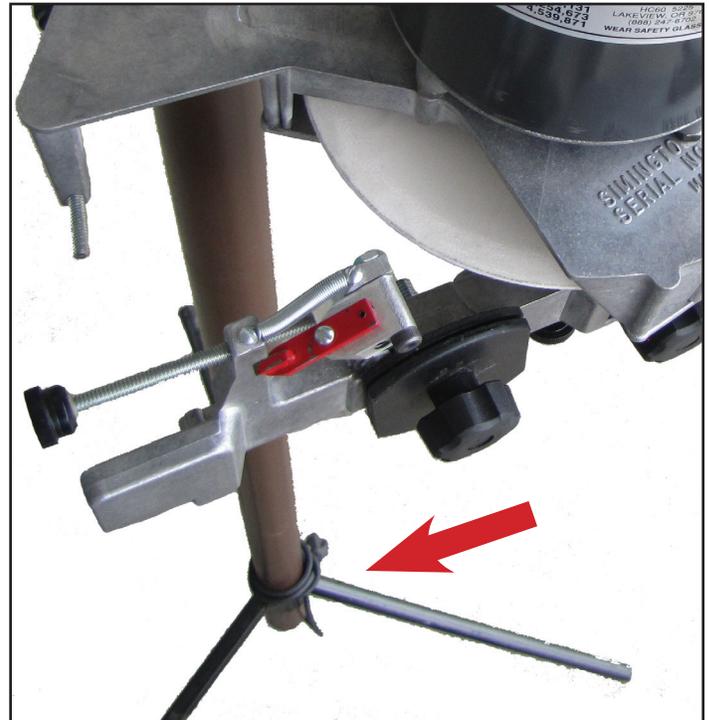
This is a top-beak. This is what happens when the wheel's corner is set too high in a tooth. A chain with a top-beak will not perform well. This image is from Oregon Cutting Systems, makers of top-quality square-chisel saw chain.



This is a side-beak. This is what happens when the wheel's corner is set too low in a tooth. A chain with a side-beak will still cut, but it won't stay sharp as long as a tooth with proper corner alignment. This image is from Oregon Cutting Systems, makers of top-quality square-chisel saw chain.



When replacing the grinding wheel, be sure to replace the wheel guard.



Place the main support-tube in the stand base and tighten the locking bolts. Leave plenty of space for the power-cord to exit under the support-tube.

### What to Do with Warped or Cracked Wheels

You may occasionally receive a brand new wheel that is warped or cracked. Always inspect a wheel before you install it on a grinder. If you install a cracked or warped wheel, it may explode when you turn the grinder on, so be careful.

To inspect a wheel, first give it a good visual look-over. Next, hold the wheel in the center and lightly tap the wheel with your finger nail. Vitrified wheels should “ring” a little. If the response to your tap is a “thud,” look closely for a crack. Also, don’t overtighten a wheel when you install it as this can crack a wheel.

This is also a good time to check for a warp. Before you turn the grinder on, spin the wheel by hand. Look for a wobble. If the wheel is warped, don’t use it. If you turn the grinder on and the machine vibrates, don’t use it. If you spin the wheel by hand and it looks good, but after turning the motor on you notice a “slight” wobble, you are probably OK. Few grinding wheels are perfect and a slight wobble will be removed the first time you dress the wheel.

Also, don’t forget to replace the wheel guard when you replace the grinding wheel. A grinding wheel will sometimes break when you spin it for the first time. A wheel guard will help contain it.

### When to Replace a Diamond-Tipped Wheel Dresser

Wheel dressers occasionally need to be replaced. What eventually happens is the dresser quits working because the diamond(s) in the end of the dresser fall out. Most of the time, a grinder operator will not realize this until he goes to dress the wheel. Instead of the dresser shaping the wheel, the wheel grinds the metal end off the dresser shaft. To fix this, you must replace the dresser with the one you keep as a spare.

What? You don’t have a spare? Since you have two dressers, you can limp by using the one good dresser to dress both planes. First, install the dresser in the arm that dresses the top of the wheel and dress it. Then remove this dresser and reinstall it on the other arm. Once installed here, you can dress the side of the wheel. This will get you by until you can get some replacement dressers.

When replacing the dressers, we recommend using multi-point dressers rather than the single-point type. The single-points are more durable and can remove wheel material more quickly, but the multi-points put a nicer finish on the surface of the wheel and usually produce the best corner.

### For Parts, Repair, & Service

For more information or to answer questions you have about your Simington grinder, contact the companies listed below. For more information on all aspects of care and maintenance of square-chisel saw chain visit: [www.madsens1.com](http://www.madsens1.com).

In North America:

Madsen’s Shop & Supply Inc.  
1408 S Gold Street  
Centralia WA 98531  
Phone: 360-736-1336  
Fax: 360-736-9522  
Internet: [www.madsens1.com](http://www.madsens1.com)

In Europe:

Forst-Shop, Knorr & Ryser  
Bürenstrasse 95  
4574 Lüsslingen  
Switzerland  
Jeff Ryser: [jryser@hotmail.com](mailto:jryser@hotmail.com)  
Orders: +41 78 763 45 90

In other parts of the world:

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19203 West Side Road  
Lakeview OR 97630  
Phone: 541-947-4444