



## KNEWSLETTER IN A KNUTSHELL



- ✓ Remington Knives
- ✓ Heat treating Part 2
- ✓ Micarta
- ✓ Show Application
- ✓ Lesson of Preparedness

Our international membership is happily involved with "Anything that goes 'cut'!"

November 2015

## Seldom Seen Remington Utility Knives

Jim Pitblado

Remington made a large number of four blade 3-3/4 inch utility knives. Over the years I have managed to collect 18 variations of the Remington Official Boy Scout Knife and five variations of the red, white, and blue patriotic knife, R3335, all with the 3-3/4 inch body and four blades. I am relatively certain that most utility knife collectors are familiar with the variations in etches, tang stamps, bolsters, screwdrivers, can openers and shields on these knives; so I will not cover any of the above in this article.

So my purpose in this article is to show and discuss examples of Remington 3-3/4 inch utility knives with four blades which are seldom seen and relatively difficult to find. I am sure that this article will miss some that I have not seen and look forward to hearing from you about any variations that I do not discuss.

The basis for this article is the Remington *C1 Catalog* pages 50 and 51, *C4 Catalog* page 9, and the Remington *C5 Catalog* pages 60 and 61. Of course over the years the knives pictured in these early catalogs changed with variations in tang stamps, shields, blades, can openers, etches and liners. These changes can help date the knives which were made from 1920 to 1940.

The knives in this article are broken down into three sections as:

Variation in the R3333 utility knife, commonly called the unofficial boy scout knife: Unusual Tang Stamped Utility Knives, Advertising and Club knives.

The R3333, or unofficial boy scout knife shown in Picture 1, is an early R4393 which later became the R3333 utility knife. Picture 2 shows two early variations of the R3333. One has the Remington long pull blade; the other has a spear blade. Both have the same Remington trademark, Scout Knife Etch. Picture 3 shows a later R3333 with a master knife etch and two piece can opener



Picture 1

with horizontal lift and a transition Pal Blade Co utility. The earlier knives had a long pull blade and were etched Remington trade mark, Boy Scout or later Remington trade mark or, after 1934, Remington Master Knife. The early knives had a short screwdriver and a vertical lift, one piece can opener transitioning into a two piece can opener and horizontal lift and a longer screwdriver.



Picture 2



Picture 3

The tang stamps also transitioned over time from the early Remington UMC inside a circle, then to the Remington UMC inside a circle made in the USA, then to the script Remington inside circle made in USA. The shields also changed from the acorn shield scout knife to a federal shield. That last knife, produced by Pal, is probably a prototype with all Remington parts, a Pal etch and tang stamp, no bolster liners and a federal shield.

The second grouping of utility knives consists of those with unusual tang stamps. Picture 4 shows the R3322, or Army Knife, which is shown with the early Remington tang stamp, long pull master blade, composition handles with buckeye pins, no shackle and an acorn shield stamped USA and short screwdriver. The second knife in Picture 4 is the R3863 which has the tang stamp number for the R4393/R3333 which was produced without a bail. It is an



Picture 4

Continued on page 6

# Phenolic-Cotton Fabric Laminate

ibdennis

Recently I have been mesmerized by a product that is generally termed thermoset composite or phenolic resin based. In the knife community this, as used as handle material, is commonly called Micarta.



Micarta is a brand name for composites of carbon fiber, fiberglass, paper, canvas, linen, or other fabric in a thermosetting resin. It was originally used in electrical and decorative applications. This resin based product was developed by George Westinghouse as early as 1910 using phenolic resins invented by Leo Baekeland. The etymology of the word Micarta might have been derived from “mica” which was originally used as an insulating material. And today in my electrical world this material is used as an electrical insulator and can be found in electrical components, electronics and motors. We could also speculate that Leo Henricus Arthur Baekeland, who was called “the father of the plastics industry,” added his middle name “Arthur” to “Mica” and came up with Micarta. But that is only a wild and wooly guess on my part, as I have found no source to determine the etymology of the word Micarta.

There is a sawmill that I visit that uses phenolic resin based blocks as a saw guide for a huge bandsaw. The blade touches on the guides and helps to keep the cuts even. The band saw blades tend to twist, and the composite material guides the blade so it makes straight cuts. The material is hard but soft enough

to not erode the steel blade. Eventually the blade does wear the guides down, and they need replacing. Every once in awhile I am offered these throw away blocks which I give to knifemakers who can experiment with this material to make knife handles. I searched deeper into the actual product that I received by contacting **Burton Saw** in Eugene. An MSDS sheet showed that Norplex Micarta was the manufacturer; and, aside from being true Micarta, it also carried the generic name of “Phenolic-Cotton Fabric Laminate.”

And then there is the early cutlery industry. In 1916 Robeson Cutlery used a paper impregnated compound for its knife handles. It wasn't called Micarta then but more likely resin impregnated fibre laminates. (The name Micarta is a registered trademark but now finds itself in the same category as Kleenex.) The Robeson knife that started this article is a whittler pattern that has dark composite handles. Charles Noyes, the Robeson collector and I fussed over identifying the handle material; and then, with the advise of Mark Zalesky (editor of *Knife Magazine*), I read a 2001 article by Robert Palmer that was entitled *Paper Handles on a Knife?* After reading the patents referenced in this article, the clues pointed to resin impregnated paper to make these handles. This material is not as striking as bone, celluloid, stag, or wood; but it has all of them beat in durability.

In our pocketknife collection, Robeson knives are the only knives prior to the 1950s I have found to have used this handle material. In fact in our collection of utility scout knives, we have only two examples of phenolic resin handled pocketknives. The only explanation for so few might be “they ain't pretty.” In fact after years of use and wear, they do not become prettier but suffer the bangs, bumps and scratches that only a tough

material can endure. If you look at an old resin impregnated handle, you will notice it as dark or black; and under a bright light and magnifier, you will see the layers which more than likely are paper. This effect cannot be duplicated with celluloid.

Making commercial Micarta is a treatise unto itself, and I really do not want to go there. If one lets their fingers dance through the Internet, they will quickly become overwhelmed with the research on this product and its variations and uses. One more area I do not want to



enter is the variations to choose which product might best suit a knifemaker for use as a knife handle. One U-Tube video I watched showed how one can make their own thermoset composite (Micarta) using Bondo fiberglass resin. A bit messy, but one can create their very own ingenious and colorful material.

In a short description: use 6” squares of cotton, linen or canvas and cover each square with the fiberglass resin. As each square is covered in resin, it is stacked on itself and then placed between two flat pieces of metal or wood and clamped into place. After the resin hardens, you now have your piece of resin impregnated handle material. There are a lot of options available in this procedure. How thick the material is, and how thick you want your product are considerations. What color and the nature of the fabric also are factors to consider.

We have several kitchen knives made by **Bill Harsey** that have handles which we have forever called ivory linen Micarta. They were made in the early 1980s, and

*Continued on page 4*





## December Mini Show

We are gaining on table-holders, but not near enough. Help us out by participating in this one day December 5 Knife Show. Only \$40, and you can be the captain of your own knife table. If nothing else, this Show is a great social event. Help support the OKCA and help foster our organization with "anything that goes cut." This Show also provides a time when you can catch up with your dues and pay for that April 2016 table.

## Micarta Competition

The article in this issue about Micarta should be of special interest to knifemakers. The Micarta blocks I have collected will be given to anyone who will make a knife with this Micarta. At the April Show these knives will be judged based only on the work of the handle itself. An award will be issued. Only these blocks can be used. Several makers at the recent 5160 meeting took the challenge. I will have blocks available at the November 18 OKCA Club meeting and also at the December 5 Mini Show. A commitment to use the Micarta for this competition is all that is required. And besides that you will get the notoriety that you have a knife and might be able to sell it at the April Show. That is, after it has been judged.

Those thus far who have a chunk of the Micarta are **Cliff Christen, Blair Goodman, Walter Hardcastle, Mike Johnston, Eric Land, Craig Morgan and Bryan Wages**. Be careful... Be wise... Be creative... Be safe... Use protective devices and cover the mouth and nose and eyes. But you should know that if you are a maker of knives.

The pictures on this page are the block of Micarta, and the bandsaw in the sawmill



that uses the Micarta blocks to guide and align the saw.

## Articles herein....

I want to thank **Gene Martin and Jim Pitblado** for their words in this issue. More words are needed, and I know that they are out there. Please share your knowledge, as this *Knewsletter* is a perfect medium for contributions from our membership. It is what makes our organization unique.

## Bob Crowder Doming article...

**Gene Martin** added a tip to the article last month. "I enjoyed Bob Crowder's article on pin doming and found it quite informative. I do have an alternative, however, to friction fitting the pins. Dome and fit the pins as Bob describes, then place a little epoxy on the end of the pin and push it through. Once in place, take a Qtip with alcohol on it and clean up any traces of epoxy. It may cause the epoxy to take a little longer to completely set up, but it doesn't inhibit holding power. That way the pins are not affected by expansion or contraction of natural handle materials based on humidity and moisture. That removes any danger of the pins ever coming out."

## OKCA Facebook Group

Lisa Wages has taken the lead on our Facebook page. She writes: The OKCA now has its own Facebook Group! You'll be able to socialize with other members on FB, stay up-to-date on OKCA events, share show-and-tell photos from your collection, or post a blade for sale. This closed group will begin accepting

members following our November meeting. We hope you'll join our new FB community and help us build a positive online network of area knife enthusiasts.



## Another reminder...

Get your reservations in for the April 2016 bigga Show. You have until the December 15 to renew the table you had last April. After that date, tables are assigned to those on the waiting list. The mailing label might give you a clue whether you are up to date on dues. 2016 or better is the answer.

## The Sizzler...

Don't forget our monthly meeting at the Sizzler Restaurant. It is the third Wednesday of the month which makes it November 18, 2015. I always look forward to this gathering, so mark your calendar and come be with us. Come smile with us with your latest purchase. It is always nice to see my fellow knife enthusiasts.

## It ain't too early to...

Make lodging reservations for the April Show. The Valley River Inn - (541) 687-0123 - which is our partner in lodging for the Show, had a complete remodel; and, from the reports heard, it is one awesome place to stay. Get your reservations in early. The rooms fill up fast. Mention the Show when you register, as we are offered a special rate for the Oregon Knife Collectors. You might also note the Courtesy Inn - (541)345-3391 - the closest motel to the Knife Show. A Budget motel that has worked well with us over the years.

## Display Award Knives

The theme of this years display award knife is "trade knives." Makers have taken the blank and will create their interpretation of what they see as a trade knife. The overriding factor is creativity and execution of this project by the maker. 🗡️

# The Seek-Re-Tary Report

elayne

The October meeting was October 24, 2015 at the Sizzler Restaurant, Eugene/Springfield OR. We had 35 present. We are starting to receive renewals for membership for the 2016 year as well as table renewals for the April 2016 Show.

Please be very sure to check the label on this *Knewslettter* to be sure it has the correct date (2015 - expires December 31, 2015). You must be a current 2016 member to enter Friday, April 8, during set up for the Show. To contact the OKCA (elayne) (541)484-5564 or snail mail (P O Box 2091) Eugene OR 97402 or email [info@oregonknifeclub.org](mailto:info@oregonknifeclub.org). If you call, please leave a message if the answering machine kicks in. We do return calls as soon as possible.

We have reserved the Wheeler Pavilion at

the Lane Events Center for a **December 5** Show. Hours are 8:00am - 4:00pm. Set up will be at 7:00am. The price for a table is \$40.00. Payment in advance is required, an application is not necessary; note on the payment December Show. We hope to fill 80 tables. Please support our event with your presence as a table-holder or a visitor. Please bring a Christmas toy for a boy or a girl. Toy must be new and unwrapped. **Bryan Christensen** has coordinated for these to be donated to children who would otherwise have no gifts for Christmas. Please contribute to this very worthy cause.

The December Show will be an opportunity to renew your membership and/or pay for your 2016 April Show tables. The deadline for first right of refusal for your 2016 table is December 15, 2015. Membership cards will be available for pick up at the December 5 Show. If you are not able to pick up your

card, it will be mailed in January with the table confirmations. A table application and membership form is included in this *Knewslettter*.

We have not decided on the 2016 OKCA knife. As soon as information (description and price) is available, it will be announced. **Roy Humenick** has volunteered to coordinate this.

If you are shipping items to the OKCA, please use our special postal address of OKCA-3003 W 11-PMB 172-EUGENE OR 97402. The mailing address for correspondence, memberships, table payments and articles is OKCA - P O Box 2091 - EUGENE OR 97402. You may always contact us via email or phone. We do return telephone calls if a message is left.

See you at the meeting, November 18, at the Sizzler Restaurant, Gateway Blvd, Eugene/Springfield OR. ↘



## *Phenolic-Cotton Fabric Laminate continued from page 2*

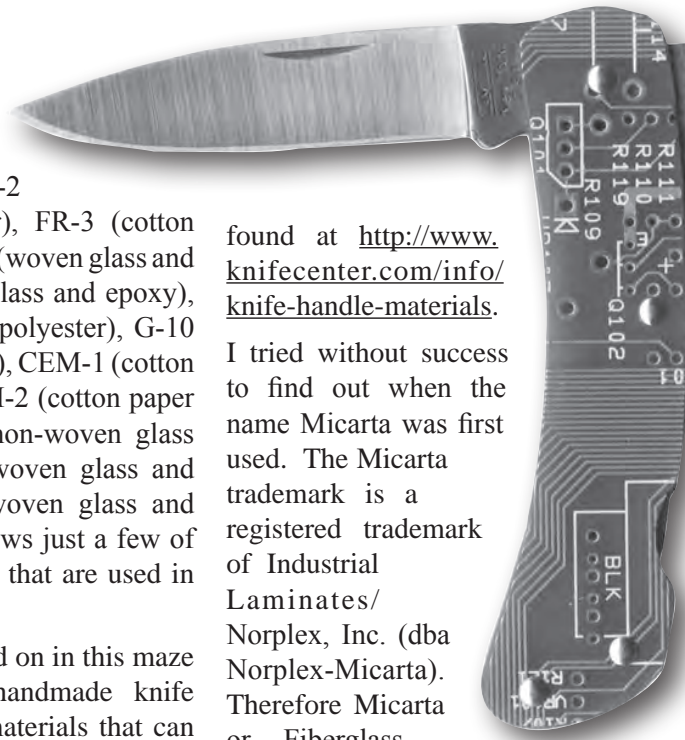
the handles are durable, strong and have not shrunk at all. The most amazing thing is how light exposure has transformed the original almost light colored ivory to a beautiful orange-cast darker, ivory color which enhances the linen layering. I have been told that this type Micarta is not currently available commercially today.

In our accumulation of handmade knives, we can identify almost every maker as having made a Micarta handled knife. In most cases this choice had to do with durability and functionality and not so much for pretty. Get it dirty, greasy, or wet, drop it, throw it and use it heavy and without mercy; it comes back to its original fit and finish. One can't say that about too many other handle materials.

Printed circuit boards are a good way to see the myriads of laminates that make up electrical boards. The base board is known for its insulating properties. Camillus, back in the 1990s, made a few patterns of folding knives which had printed circuit board handles. They made for a pretty and unusual handle.

Well known laminate materials used in the printed circuit boards (PCB) industry are FR-2 (phenolic cotton paper), FR-3 (cotton paper and epoxy), FR-4 (woven glass and epoxy), FR-5 (woven glass and epoxy), FR-6 (matte glass and polyester), G-10 (woven glass and epoxy), CEM-1 (cotton paper and epoxy), CEM-2 (cotton paper and epoxy), CEM-3 (non-woven glass and epoxy), CEM-4 (woven glass and epoxy) and CEM-5 (woven glass and polyester). This list shows just a few of the many combinations that are used in just one industry.

The study can go on and on in this maze of material. In the handmade knife world, there are four materials that can be mentioned: carbon fiber, strands of carbon woven into cloth; G-10, fiberglass which consists of strands of glass woven into a cloth; Micarta, commonly linen or any cloth like material; and ZYTEL®, a Du Pont developed thermoplastic material. A more expanded explanation on these knife handle materials can be



found at <http://www.knifecenter.com/info/knife-handle-materials>.

I tried without success to find out when the name Micarta was first used. The Micarta trademark is a registered trademark of Industrial Laminates/ Norplex, Inc. (dba Norplex-Micarta). Therefore Micarta or Fiberglass Resin or Laminate Materials or phenolic-cotton fabric laminate or Phenolic Resin or Resin Impregnated Fibre Laminates or Thermoset Composites..... all of these describe what could be a knife handle material. ↘





# OREGON KNIFE COLLECTORS ASSOCIATION

P.O. BOX 2091 • EUGENE, OR 97402

MEMBERSHIP APPLICATION AND SHOW TABLE CONTRACT

**\*PLEASE RETURN THIS ENTIRE PAGE or a photocopy. DO NOT CUT IT UP!\***

email: [okca@oregonknifeclub.org](mailto:okca@oregonknifeclub.org)

Name(s) \_\_\_\_\_

Mailing Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone: Eve ( \_\_\_\_\_ ) \_\_\_\_\_ Day ( \_\_\_\_\_ ) \_\_\_\_\_ Date \_\_\_\_\_

Collector  Knifemaker  Dealer  Mfr./Distrib.  Other \_\_\_\_\_ Email \_\_\_\_\_

OKCA membership includes knewsletter, dinner/swap meetings, free admission to OKCA shows.

\_\_\_\_ Start/ \_\_\_\_ Renew my/our OKCA membership (\$20 individual/\$25 family) \$ \_\_\_\_\_

## 41<sup>ST</sup> ANNUAL OREGON KNIFE SHOW • APRIL 9-10, 2016 360 — 8'x30" TABLES

Exhibit Hall, Lane Events Center and Fairgrounds, 796 West 13th Ave., Eugene, Oregon.

For Information Contact Show Chairman: Dennis Ellingsen, (541) 484-5564

**AUTOMATIC RESERVATIONS:** If you had a table at the 2015 Show, you have an automatic reservation for the same table in 2016, but THIS RESERVATION EXPIRES DECEMBER 15, 2015. You may still apply for a table after this date, but we cannot guarantee a table after December 15. NO RESERVATIONS HONORED OR APPLICATIONS ACCEPTED WITHOUT FULL PAYMENT! Note to NEW exhibitors: your table(s) will be assigned after 12/15/2015.

**ALL TABLE-HOLDERS AND VISITORS** agree to abide by the OKCA Show rules and to hold the OKCA, its officers, and the Lane Events Center harmless for any accident, loss, damage, theft, or injury.

**ANY QUESTION OR DISPUTE** arising during the Show shall be resolved by the Show Chairman, whose decision shall be final.

**THIS IS A KNIFE SHOW.** All tables must be 90% knives or knife related items (e.g. swords, axes, edged tools, edged weapons, knife books, knifemaking supplies). If in doubt, check with the Show Chairman ahead of time. The OKCA reserves the right to bar any item from display or sale. No firearms made after 1898 may be sold or shown at this Show.

**ALL EXHIBITORS are required to keep their tables set up throughout the public hours of the Show: 8 AM Saturday to 3 PM Sunday. ANY EXHIBITOR WHO LEAVES OR COVERS THEIR TABLE BEFORE 3 PM SUNDAY FORFEITS FUTURE RESERVATIONS AND WILL BE DENIED TABLES AT FUTURE OREGON KNIFE SHOWS.**

**DISPLAY TABLES** will be around the perimeter of the room. Displays are eligible for display awards, which are hand-made knives donated by members and supporters of OKCA. Display judging will be by rules established by OKCA. Special category awards may also be offered. **NOTHING MAY BE SOLD FROM DISPLAY TABLES.**

**SALE/TRADE TABLES** Sharing of tables will not be allowed. Exhibitors must comply with all applicable local, state, and federal laws. Oregon has NO SALES TAX.

**BADGES:** Each table-holder is entitled to one additional Show badge. **NO EXCEPTIONS.**

**KNIFEMAKERS** who are present and are table-holders at this Show may enter knives in the knifemaking award competition.

**FOR MORE INFORMATION** on categories and judging criteria in the display and hand-made knife competitions, contact the Show Chairman.

**SHOW FACILITATORS** will be provided by OKCA from 10AM Friday until 4 PM Sunday. However, exhibitors are responsible for watching their own tables. Neither the OKCA nor the Lane Events Center will be responsible for any loss, theft, damage, or injury of any kind.

**CITY AND COUNTY REGULATIONS** require that there be:

- No Smoking within the Exhibit Hall at any time;
- No alcoholic beverages consumed within the Exhibit Hall during the public hours of the Show;
- No loaded firearms worn or displayed at the Show;
- No swords or knives brandished or displayed in a provocative manner.

Violators of these safety rules will be asked to leave.

**NOTE ON SWITCHBLADES AND DAGGERS:** In Oregon it is legal to make, sell, buy, or own switchblade knives. However, it is **ILLEGAL** to carry a switchblade knife, a gravity knife, a dagger, or a dirk concealed on one's person, or for a convicted felon to possess a switchblade or gravity knife. Most other states have banned switchblade knives. Under federal law, it is **ILLEGAL** to mail, carry, or ship a switchblade or gravity knife across state lines.

The Oregon Knife Collectors Association is not responsible for force majeure.

**EXHIBITOR CONTRACT:** PLEASE ENCLOSE FULL PAYMENT WITH THIS FORM. Full refund granted if reservation canceled by February 15, 2016. **DON'T GET LEFT OUT!!!**  
**MAIL THIS PAGE AND YOUR CHECK TODAY. A signature is required.**

Type of knives on your tables \_\_\_\_\_

Name for second badge \_\_\_\_\_ (two badges per table-holder)

Qty \_\_\_\_\_ Club Dues (Total from above) .....\$ \_\_\_\_\_

Qty \_\_\_\_\_ Sale/Trade table(s) @ \$120 each (members only).....\$ \_\_\_\_\_

Qty \_\_\_\_\_ Collector Display table(s) **free with sale table:**.....# \_\_\_\_\_

Qty \_\_\_\_\_ Collector Display table(s) w/o trade table @ \$100 each.....\$ \_\_\_\_\_

TOTAL ENCLOSED (make check payable to O.K.C.A.) .....\$ \_\_\_\_\_

I have read and agree to abide by the OKCA Show rules as set forth in this contract, and to hold the OKCA, its officers, and the Lane Events Center harmless for any accident, damage, loss, theft, or injury. **Signature and date required.**

Signature \_\_\_\_\_ Date \_\_\_\_\_

### SHOW SCHEDULE

**Friday, April 08, 2016.**

10am - 7pm set-up; open ONLY to table-holders and members of OKCA.

**Saturday, April 09, 2016.**

7am-8am set-up. 8am-5pm open to public.

**Sunday, April 10, 2016.**

8am-9am set-up. 9am-3pm open to public.

**Tables that are cancelled will revert back to the OKCA. Subcontracting tables is not permitted.**

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[www.oregonknifeclub.org](http://www.oregonknifeclub.org)

early knife R3863 Remington UMC inside circle tang stamp, one piece with can opener with vertical lift, short screwdriver, and in this case an acorn shield marked Auto Knife. I have also seen one with just a plain acorn shield.



Picture 5

Picture 5 shows the R4394 Remington pearl handled 3- 3/4 inch utility knife. This knife does not have the long pull nor acorn shield shown in the *C25 Catalog*. It has a later Remington tang stamp and short screwdriver and one piece can opener and R4394 stamped on the back of the tang. It also has all nickel silver metal parts as is generally found on Remington pearl handled knives. Not many of these were produced due to the fragile pearl scales and retail price.

The final grouping of Advertising and Club Remington utility knives starts out with Picture 6 showing a 1920s R3333 without an R number but with the Remington spear blade and trademark etch, the tang stamped Remington inside the circle made in the USA, short screwdriver and one piece can opener with vertical lift and lined bolster. A 1928 *Nehi Catalogue* showed this knife could be redeemed for 66 cents and 66 Nehi crowns (bottle caps).

Picture 6 also shows the large Purina Remington advertising utility knife. This has the spear blade with Remington

trademark etch, no R number but the early Remington UMC in circle tang stamp, short screwdriver, and two piece vertical lift can opener and the punch is replaced with a pen blade. On the backside it says, "For Live Cars" and was an advertisement for shipping live animals by railcar. This is another very hard to find knife in any condition.

Picture 7 shows "The Highlander Boys" Club utility knife which is exactly like a Remington Official Boy Scout Knife with the following exceptions. It has no R number. It has a Highlander Boys shield, and the spear blade has an intricate four part etch on it. The etch depicts four scenes representing the program of physical, mental, social and spiritual development. The organization was started by George Olinger, a mortician, in the highland section of Colorado, hence the name Highlander Boys. It was a quasi-military program with uniforms and squad through battalion organization. The top knife in Picture 7 has the Remington UMC in circle made in USA tang stamp, no tang number, a two piece can opener with vertical lift and a long screwdriver. Seen below is a later version of this knife with the two piece can opener with horizontal lift. Both of these variations are very scarce.

The final Remington utility knife is a club knife that none of us has yet seen. Bernard Levine provided me with a picture of the order blank which is shown in Picture 8. In fact, the only reason it may be a Remington is because that is what it says on the order blank. It looks to be a Remington with a different style long pull master blade, a normal Remington screwdriver, can opener and punch; but there is no Remington stamp on the blade to identify it.

I hope you have enjoyed both my article and the pictures which are part of this communication. Should you be aware of other Remington non official utility knives that are 3-3/4 inch closed, I would very much like to know about them.



Picture 6



Picture 7

## THE OFFICIAL KNIFE

This is the official knife of the Open Road Pioneer Club. It is a genuine Remington knife. The name Remington on the blade is your guarantee of very high quality.

On the handle is reproduced the seal of the Open Road Pioneers and the name "The Open Road" is carefully etched on the blade. Its master blade is the choicest thing you ever saw. It has a leather punch, can opener, screw driver and bottle opener. This knife was especially designed by Deep River Jim and the Campfire Chief. It is the signed, especially for outdoor use, for camping, fishing, hunting, trapping, etc. It is the very finest knife you could obtain anywhere.

A knife you will be proud to own. It was designed especially for you. Be sure to get your knife at once. Use coupon below.

*Pioneers!  
This is the knife for all of us. I advise you to get yours now. I'll guarantee that it's a wonderful bargain.  
Deep River Jim*

### HOW YOU CAN GET THIS KNIFE

You may buy one of these knives postpaid for only \$1.50. Or you can obtain a knife by sending us one yearly subscription to The Open Road at \$1 and \$1 extra or for sending us two subscriptions at \$1 each and 6 cents extra or for three subscriptions at \$1 each.

This knife is not obtainable in stores. You can buy it only from the Open Road Pioneer Supply Department. Our supply of these knives is very limited now and this may be your last opportunity to obtain one at anything like this low price.

Read what Deep River Jim himself says about it. Remember this is made by Remington. A top sturdy knife designed for you. You must get yours now.

## Mail This Coupon to Deep-River Jim

Deep River Jim,  
Supply Department,  
Open Road For Boys Magazine.

Dear Jim—  
Here is my \$1.50 or the necessary subscriptions. Send that knife right out to me. I am keen for outdoor life, camping, and I would not want to let another day without a Pioneer Knife.

Name \_\_\_\_\_ City or Town \_\_\_\_\_

Picture 8





# KNIFEMAKING 101 - Heat Treating, Part 2

Gene Martin

Last time we wrote of the various parts of heat treating. Now let's talk about the science and magic involved.

Steel has a microstructure that changes at various temperatures. At room temperature steel is primarily made of the microstructures ferrite and pearlite, with maybe some cementite, depending on carbon content. Ferrite and pearlite will only hold so much carbon. This has what is called a Body Centered Cubic structure.

When steel is normalized, or allowed to cool slowly, austenite is formed. This relieves the stresses in the steel. When austenite is formed, the alignment of the grain structure transforms into a Face Centered Cubic phase. Austenite in lower than .77% carbon begins to form at 1167F. If left to slow cool, it returns to pearlite and cementite. Steels having less than a .77% carbon are called hypoeutectic steels.

As normalizing causes the steel to unstress, annealing works a bit differently. Annealing is heating the blade past the austenizing, or critical temperature, and cooling very slowly in vermiculite. (That's the stuff we keep covered to keep the cats out.) That causes the blade to slowly transform back to pearlite and cementite. It also serves to reduce the grain size again.

Cementite is the grain structure that holds the carbon that won't go into suspension. It's where we get carbon clumping. When the carbon goes into suspension and is equalized throughout the blade during high heat, it disappears.

Grain growth is always a concern to those of us who forge. It is caused by repeated cycles at high temperature or by overheating the steel. Overheating is often a problem with coal forging, less so with propane forges. Coal gets a lot hotter than propane.

After annealing, the blade is hardened. As if changing grain structure and grain size in a simple bar of steel isn't magic enough,



now we're getting into real magic.

When the blade is taken above the higher end of austenizing, or critical temperature, the carbon has gone into suspension throughout the blade; and it's ready to quench.

When the blade is quenched, extremely rapidly cooled, martensite grains begin to appear. They grow and eat the austenite, thus replacing it. That, in and of itself, is magic. They also go into a state called Body Centered Tetragonal. It's basically an oblong cube. If a blade hasn't been ground symmetrically, it warps right about here. Furthering the magic is that carbides, those little, tiny, cut like crazy things, also happen during this. And it happens in far less time than it takes to read this paragraph.

The reason the blade warps is because, on an unevenly ground blade, these oblong BCT structures form faster on one side of the blade than the other. As these structures expand and solidify, they push against the other side of the blade. That's why symmetry is so very important.

Another bit of magic that happens is the hardened blade is much stronger than a soft blade.

I'd call all of that pretty magical, wouldn't you?

Finally, we get to tempering. Tempering is heating the blade slightly to soften it a bit and make it less brittle. The type of tempering, with high or low, or anywhere in between, determines how hard the blade is. The higher the temperature, the softer the steel. Knowing that is how we can make a hard blade and softer back spring for a folder from the same piece of steel.

Something that also influences the critical temperate is just what all is in the steel. Simple steel is mostly iron, a little carbon and a little manganese. A trace of sulfur and phosphorous is almost always present as impurities. They just can't get the stuff out of steel.

When heat treating 1095, we need to reach 1525F, hold it just long enough to saturate, "soak" or equalize the heat, then quench it. By way of comparison, ATS334 needs to go to 1925-1975F, hold for 30 minutes, then quench. They have almost the same amount of carbon; but ATS34, a good stainless knife steel, has a lot of chromium and some other things in it. And ATS34 quenches in still air.

The oil hardening simple steels, those 10xx steels, are about the easiest to heat treat. All that's required is a forge or welding torch (propane, as a torch doesn't burn hot enough), a good magnet to find the critical temperature and a quench tank.

*Continued on page 8*

continued from page 6

For reference, to know how much oil your quench tank holds: 231 cubic inches equals 1 gallon.

Simply heat the blade above nonmagnetic, then quench. Either heat the whole blade or just the edge, doesn't matter. Heat to above nonmagnetic and quench. Quench it edge or point down, depending on your take shape. Make sure it goes in straight and vertical. Do not stir it with the blade as it will case warping.

Once cooled, clean the blade off so it's nice and dry, then put it in an oven and draw temper. A little toaster oven is best because it holds the temperature closer. (If you are a bachelor, you can use the kitchen oven. If you are married, don't plan on the kitchen oven if you want your wife to be happy.) Set it for the appropriate temp, generally somewhere between 325-400F, and let it cool for half an hour to an hour. It's done. Next



time we'll talk about deep hardening steels and air hardening steels.

My thanks to Wayne Goddard who

taught me this stuff 20 years ago, and Dr. John Verhoeven, a PhD who wrote a book about it. 🐉

## The Lesson of Preparedness

One day Musashi and his attendant were walking down a forest path. Several dozen yards behind them, quite by chance, a fellow *samurai* followed, traveling in the same direction. After a time Musashi and his charge came upon the body of a man lying along the side of the narrow path. Musashi calmly drew his *wakasashi* and held it casually at his side as they passed by. Once they were a good distance away, Musashi re-sheathed his blade.

The *samurai* traveling behind them approached the same body and stopped to kick it. When it failed to move, the *samurai* laughed, and in a loud voice taunted Musashi. "Do all the *samurai* in your province fear the dead so?" he asked. The attendant's face reddened with shame as he heard the man continue to ridicule his master. Musashi ignored the comments and continued walking.

Suddenly the "dead" man leapt to his feet and, brandishing a knife, stabbed the criticizing *samurai* through the heart, killing him instantly. The deceptive bandit quickly began stripping the

fallen warrior of his possessions.

Musashi stopped to witness this. The thief, seeing that Musashi was watching, gathered what he could and fled into the forest. Musashi's attendant turned to his master and asked, "When we passed that man, how did you know that he was not dead?"

"I didn't," replied Musashi. "But only a foolish man walks unprepared into something that stands plainly before him."

The attendant pondered this as he and his master continued down the path together. 🐉







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Layout and printing by instaprint -  
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