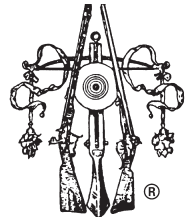




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## Bluing Instructions & Supplies

### OXYNATE® NO. 7 HOT BLUING

#### INTRODUCTION

Since the dawn of time, sportsmen have been spending more hours cleaning and caring for their shooting and hunting equipment than have ever been spent using this equipment. Even King David of Biblical fame cared for and practiced with his sidearm, the sling. The Yeomen of England and the Longriflemen of New England realized that in order to stay alive, it was absolutely essential to ensure the reliability of their shooting and hunting equipment.

The urge to care for your gun, to keep it in top flight condition, was born in you. The cave man had little luck with a rotten club - or an Indian much use for a bow that had lost its spring. How many millions of hours do you suppose our ancient ancestors spent in rubbing oil into their bows or hacking at that club point so that when the time did come for use, it would be ready? Yes, the love of weapons and the desire to keep them in perfect condition is a basic part of man's construction. Until the 1940's the art of bluing guns was a closely-kept secret, known only to a very few Masters who were willing to take the time and pains to go through the lengthy process necessary to learn it and use it. These early methods of gun bluing required hours of patient rubbing and scrubbing, rusting and burnishing, to get a finish that would be durable and yet attractive. When properly applied, these older finishes are still beautiful.

Modern-day living cost and the higher standard of living make it impossible for the average individual to devote the multitude of hours necessary to produce a finish on a single gun that these older methods required for perfection. It would be prohibitively expensive. Fortunately, solutions are now available which make it possible to produce beautiful and durable blued finishes with but a fraction of the work and chemical skill the old methods required.

Bob Brownell, founder of Brownells, Inc., is largely responsible for the revolution in gun bluing that occurred in the gunsmithing field during the last 60+ years. Prior to his introduction of Oxynate No. 7 in the columns of *The American Rifleman*, the average hobbyist, gun lover or gunsmith either had to turn down bluing jobs or send them back to the factory. Those who did attempt the work were faced with a back-breaking job that was too often thankless and unsatisfactory. The introduction of Oxynate No. 7 did indeed prove to be a boon to the gunsmith.

Since the introduction of Oxynate 7, a great many other brands of bluing solutions with a variety of publicity and promotional claims have been shoved at the shooters and gunsmiths. Regardless of how much has been spent on advertising these other blues, Oxynate No. 7 is still the leading hot bluing solution for the gun shop. After 60+ years on the market, it still does one thing better than all the rest: it Blues Guns Successfully - every time.

#### OXYNATE NO. 7 BLUES GUNS

The Finish is simple and easy to achieve. When properly handled, Oxynate No. 7 will color the steels typically found in firearms, yet does not alter the characters or dimensions of the steel, and is an inexpensive process. Once you have mastered the simple technique of using Oxynate No. 7, you don't need to spend time and money trying, or even worrying about, the other hot bluing solutions. Oxynate No. 7 will do anything they can do. But, more important, Brownells will stand behind their customers with the technical help and support

necessary for complete satisfaction - something the other suppliers of bluing salts either cannot or will not, do. Bob, Frank and Pete Brownell's care and concern for their customers is legendary, and has built the business to its present level. And, they have fine-honed the entire crew to provide and maintain this top-quality level of Customer Service first, last and always.

Furthermore, Brownells maintains access to the production testing laboratory of the worldwide and world-famous chemical organization who custom mixes Oxynate No. 7 to Brownells' specifications. (Because of OSHA requirements for handling caustic materials, the mixing and packaging cannot be done in Montezuma.) This laboratory provides assistance for really tough bluing problems that are beyond the 100+ accumulated years experience of Brownells' own crew.

So, no matter what kind of trouble you can get into - no matter what problem may stump you - Brownells can supply you with the cure. To put it into Bob's own words, "You can't think up any situation so brain-busting in the bluing business that it hasn't happened to us - only more so". In addition, gunsmiths are constantly writing in to tell us about the cures they have found for problems in their own shops, and new techniques and procedures are always being tested and perfected in Brownells' own test shop.

These instructions are not one man's findings - or one laboratory's specifications. Rather, they are the compilation of the information passed on by those 5-10,000 working gunsmiths and serious hobbyists who are actively using Oxynate No. 7 in their own bluing shops - plus all the technical laboratory and test shop information. This means you are literally getting several hundred years worth of bluing experience all in one easy-to-read dose. A definite Plus for you, the man doing the bluing, and an asset no other bluing supplier can claim, or provide, for their hot bluing salts.

#### The Bluing Procedure is Simplicity itself . . .

. . . And consists of the following basic steps:

- 1 - Clean the properly polished gun and parts in Dicro-Clean 909™.
- 2 - Rinse and scrub in cold, clean water.
- 3 - Immerse in Oxynate No. 7 solution for 15 to 30 minutes.
- 4 - Rinse and scrub in cold, clean water.
- 5 - Rinse in boiling water.
- 6 - Immerse in Water Displacing Oil.
- 7 - Apply optional "after-treatments", if desired.

#### HOW MUCH EQUIPMENT DO YOU NEED?

Much of the equipment needed to blue guns can be made from odds and ends around your home or shop; or it can be purchased and be as exotic as the finest of production shops. Somewhere between these two poles will be the basic shop setup to fit your own needs and requirements.

Setting up a shop for bluing, either professional or hobby, is worth a lot of serious thought on your part. Bluing is the foundation on which many successful gunsmith businesses are built...it gives the gunsmith a chance to show his artistic ability, for a beautifully blued gun will create more comment among shooters than anything you can do other than building a beautiful stock. And, there are many hundreds more guns needing bluing than there are needing new stocks!

The first thing for you to determine is "Just How Much Do I Want To Spend?" While deciding that, remember, no mechanic or artist can

do good work with inferior tools. On the other hand, don't go in over your head. Maybe the shooters in your locality are going to need a lot of education before they start bringing in guns in sufficient quantity for you to justify spending a lot of money at the start.

Next, you need to decide, "How Many Guns Am I Going To Blue?". One or two guns - a dozen or so - or do you plan to make the work a profitable hobby or full-time occupation? The answers to these questions are important, for from them you can then determine just how much to spend and what items you should consider buying when starting up.

Regardless of what your answer is (if you are just starting up) do not plan on buying all your equipment in one fell swoop. Get the basic supplies first and get the BEST. Then, as time goes on, add just those items you HAVE to have and again, get the best. In this way, you will eventually - and affordably - have the best equipped shop in your locality.

## SETTING UP THE BLUING ROOM

You want to consider the location of your bluing room quite seriously, for once the word is out that you do beautiful bluing, we are told you will find people beating a path to your door - at least this is what we are told happens, time after time. It is true that guns have been blued on back porches, in garages, tool sheds, privies, barns and back rooms, but for ease of operation "down the road", plan seriously now, even tho' you are just going to use two tanks at start-up. That way, when it grows into a business for you, you will not have a lot of expensive rebuilding to do. So, consider the following:

A good floor plan for the five-or-six tank setup is a deep-side "U". The Cleaning Solution and Cold Water Rinse Tank are on the left of the "U", the Bluing Solution Tank is across the bottom, and the After-bluing Cold Water Rinse Tank and the Hot Water Rinse Tank a separate area away from the heated tanks. Our setup works clockwise, with the Cleaning Solution Tank as the first tank on the left leg. The rotation direction is totally your personal preference. With this layout, one individual can easily handle a large volume of work with a minimum of movement.

In a 5-tank setup, the tanks are as follows:

- 1) Dicro-Clean 909 Cleaning Solution Tank
- 2) Flowing Cold Water Rinse Tank (used both for rinsing after Cleaning Solution and after Bluing Solution)
- 3) Oxynate No. 7 Bluing Solution Tank
- 4) Hot Water Rinse Tank
- 5) Water Displacing Oil Tank

In a 6-tank setup, the tanks are as follows:

- 1) Dicro-Clean 909 Cleaning Solution Tank
- 2) Flowing Cold Water Rinse Tank
- 3) Oxynate No. 7 Bluing Solution Tank
- 4) After-Bluing Flowing Cold Water Rinse Tank
- 5) Hot Water Rinse Tank
- 6) Water Displacing Oil Tank

**STEAM & VENTILATION:** Be sure your bluing room is sealed off from - or entirely separate from - your shop area. There are three reasons for this. **First**, the steam from the Bluing Tank is very corrosive, and in a very short time every tool you own will be rusty if your Shop and Bluing Room are together. (This steam has even rusted tail stocks solid to lathe "ways" before the shop owner caught it!) **Secondly**, you must keep people who do not realize the hazards involved working with bluing salts, completely OUT of your bluing area. It is particularly vital that you keep all children and pets out, for involuntary massive contact with the bluing salts could prove fatal; at the very least, it can involve severe and dangerous caustic burns. Be particularly insistent on keeping people out of your bluing room. **Thirdly**, you must have proper and adequate ventilation for the bluing room. Air should come in through a vent or screened panel about 18" above floor level behind the operator, pass across the bluing tank to be sucked out above and/or behind the bluing tank and exhausted to the atmosphere. Be sure you have adequate "make-up" air from outdoors for the fan to work properly. Do not use galvanized metal anywhere in the bluing room, particularly in hood construction over the tank or framing of the fan. Do not use aluminum-bladed fans, duct work, window panels, etc. Be sure you are not ducting fumes onto an aluminum-sided building or where it will settle on any aluminum . . . simply eats it up, pronto. You must move a lot of air through the bluing room, so use a good exhaust fan, like a furnace, squirrel-cage fan (all steel only) . . . the bathroom or kitchen kind won't handle it. Don't worry about heat loss with the vent system. Keeping warm has never been a problem when bluing! The caustic fumes are a real problem, however, and you must get them out.

**WATER:** Running water in the bluing room is a fine asset if available. If you cannot hard-pipe it in, run a garden hose with a shut-off into the bluing room on bluing days.

**LIGHTING:** Good, bright lights are a necessity, and you must have one, good, incandescent light bulb directly over the After-Bluing Cold Water Rinse Tank.

**SHELVES:** A shelf or two along the walls is also mighty handy!

**DUCK BOARDS:** If much bluing is to be done, a wood slat riser or raised duck board on the floor will increase operator comfort and safety, and help prevent slipping.

## EQUIPPING THE BLUING ROOM

To set up your bluing operation on an efficient and profitable basis, you will want to consider the equipment and supplies listed below. We have covered each item in as complete detail as possible. As you blue, you will undoubtedly refer back to this section for bits and pieces of specific information listed under each piece of equipment.

**TANKS:** The following solutions require tanks: 909" Cleaning Solution; Cold Water Rinse; Bluing Solution; Hot Water Rinse and Water Displacing Oil.

Two tanks are the "bare-bones" minimum you can get by with. This is for the man who wants to blue an occasional gun. One tank is used for the Oxynate No. 7; the second tank will be used for everything else except the Water Displacing Oil. This includes: 1) the 909 Cleaning Solution; 2) the two Cold Water Rinses, and 3) the Hot Water Rinse. To make the system work with only 2 tanks, you have to do some dumping and refilling during the bluing cycle. **1)** After the gun is cleaned in the 909 Cleaning Solution Tank, the Cleaning Solution is immediately dumped. **2)** The Tank is filled with clean, cold water into which the gun is plunged to be scrubbed and rinsed before, **3)** It is transferred to the Bluing Tank, which must be at operating temperature. **4)** While the gun is bluing, the Tank is dumped and refilled with fresh, clean, cold water in which the gun is rinsed after it comes out of the Bluing Tank. **5)** The water in the Tank is again changed to hot water which is brought to a boil, and the gun is soaked in the boiling water for 10 to 30 minutes. **6)** The excess water is shaken off the gun and it is liberally covered with Water Displacing Oil (soaking in a tank of Water Displacing Oil is preferred).

The use of additional tanks not only increases your efficiency, but also cuts down on operator time, which lets you turn out more guns for less cost per gun. Four tanks - **1)** 909 Cleaning Solution, **2)** Cold Water Rinse, **3)** Bluing Solution, and **4)** Boiling Water Rinse - make for a much better operation than the two tank method. The addition of two more tanks for a total of six, - one for a separate, After-Bluing Cold Water Rinse (to prevent cross-contamination from the cleaning solution's residue on the freshly blued gun), and the other for Water Displacing Oil - makes an ideal and very efficient setup . . . and, is our personal choice for the number of tanks to use.

Tanks can be made of either black iron, stainless steel or gel-coated fiberglass, depending upon which solutions you are going to put into them.

**Black Iron:** Suitable for all solutions used in the bluing operation. (**Note:** All seams on the metal tanks must be welded; they must never be brazed, because it takes less than .001 oz. of free copper per gallon of Bluing Solution to "kill" a Bluing Solution.)

**Stainless Steel:** Suitable for all solutions used in the bluing operation, **except for bluing salts**, because there is the possibility of electrolytic action between the bluing salts, the stainless steel and the gun metal. When this happens, it results in gray streaks and/or little "silvery" specks in the finished blue job. These tanks are superb for all other operations, but are not necessary.

**Gel-Coated Fiberglass:** Suitable for all of the non-heated solutions; the Cold Water Rinse Tanks and the Water Displacing Oil Tank. Also ideal for other chemicals used in the Bluing Room - Acid for etching, Rust Remover, Pro-Sheen™, or Pro-Tek™.

The average pistol tank should be 6" wide, 6" deep and at least 16" long. Common black iron or mild steel bread pans are satisfactory for pistol work, providing the pan is large enough. (These are the "old fashioned" bread pans, and can sometimes be found at household sales. Modern bread pans are usually aluminum or teflon-coated aluminum, which are rapidly destroyed by the Bluing Solution, besides destroying the Bluing Solution.) Or, you can use the "Half Tank" shown in the catalog section at the end of these instructions.

Rifle tanks should be 6" wide, 6" deep and at least 40" long (44" if you blue some of the muzzleloading barrels).

We do not recommend zinc-plated (galvanized) tanks; however, they are occasionally used for rinse tanks. It can be done, but there is a strong possibility of trouble. Due to the composition of your local water, there is a strong chance that there will be an electrolytic action setup when the steel gun parts are placed in water in a galvanized tank. This results in a mild transfer of zinc from the tank to the gun, and that results in white specks in the final bluing job.

Ideally, the Cold Water Rinse Tank should be set up as a "top-overflow" tank to make it self-cleaning and prevent redepositing residue from the cleaning operation - or the after-bluing rinse - on the guns. By keeping the surface cleaned off, the scrubbed gun or part is brought back up through a clean water surface and comes out clean instead of being recoated with the junk just scrubbed off it. This simple modification will solve most of your contamination problems and thus, your speckling and spotting problems, too.

The top-overflow system can be accomplished in several ways; we have given two suggestions to get your thinking started.

1) Set the tank in an oversized, outside container that is connected to a drain line. Connect a garden hose to a section of rigid plastic pipe or hose with several holes drilled in it, and lay it in the bottom of the tank, connecting the other end to the cold water faucet. As the water flows through the pipe and out the holes, clean, fresh water is brought into the bottom of the tank forcing the old water upward over the sides of the tank, into the overflow container and down the drain. In doing so, all residue from the 909 Cleaning Solution Bath or the Bluing Solution Bath is constantly being flushed out of the tank, assuring a continuous and adequate supply of clean, fresh water for rinsing. Set the tank so the water flows evenly over the top edge - all around the top edge - to prevent "dead-spots" of old water in the tank. Use a medium water flow.

2) Using one of the Black Iron or Fiberglass Tanks, drill a series of holes along one end. Bring fresh water into the tank at the opposite end, and, using a medium water flow, keep the surface of the rinse Tank flushed clean. It is important to have a constantly replenished supply of fresh water for this method to work. the tank to keep the tanks' surface flushed clean.

Finally, if none of these methods will work for you, be sure to dump and refill the Cold Water Rinse Tank frequently to remove the junk that floats to the surface and stays there to possibly discolor or streak your bluing.

**HEAT SOURCE:** You will need a heat source for the 909 Cleaning Solution Tank, and Bluing Solution Tank and the Hot Water Rinse Tank. (In our discussion, we will be talking about Pipe burners, altho' alternate heat sources can be used.)

**The Bluing Tank Pipe Burners**, with a 42,000 BTU per hour input, have been specifically designed and built for us by one of the country's leading industrial gas burner manufacturers to heat and operate a 6" x 6" x 40" Black Iron Tank containing 4 gallons of working Oxynate No. 7 Bluing Solution. We had these special pipe burners made because the heat source for the Bluing Solution Tank is quite critical. It must be able to bring the volume of the Bluing solution up to the operating temperature fairly rapidly, yet must be adjustable down to the proper "carrying" flame for correct maintenance and control of the Bluing Solution's operating temperature. (See the specific instructions on this step later.) The Bluing Solution Tank Pipe Burners are shown in the catalog section at the end of these instructions. They are definitely recommended and worthy of your serious consideration.

**The Hot Water Tank Pipe Burners**, designed and made for us by the same people who make the Bluing Tank Pipe Burners, are specially-sized 25,000 BTU per hour input gas burners to efficiently heat the 909 Cleaning Solution Tank and the Hot Water Rinse Tank. For the occasional bluing operation, these two tanks can be heated over heavy-duty hot plates, gas ring burners or other heavy-duty, high-output heat sources.

**Half Tank Burners**, designed to be used with the pistol-length Half Tanks. Gas input is 10,000 BTU per hour. Do not attempt to use these short burners to heat the full-length tanks.

**Natural Gas** and **LP Gas** are the two types of gas used for fuel to operate the Pipe Burners. There are several specifications for each that you must be aware of - specifically: operating pressure, gas line pipe diameter sizes relative to distance to the regulator, and orifice sizes.

## TECHNICAL SPECIFICATIONS FOR PIPE BURNERS

### NATURAL GAS SPECIFICATIONS

Pressure at Burner: 4 inches to 6 inches of water column  
 Orifice Size on Bluing Solution Tank Pipe Burners: #32 drill  
 Orifice Size on Hot Water Tank Pipe Burners: #43 drill  
 Orifice Size on Half Tank Pipe Burners: #52 drill

#### SUPPLY PIPE DIAMETERS REQUIRED

BLUING TANK PIPE BURNERS USING NATURAL GAS					
No. of BURNERS	DISTANCE TO REGULATOR				
	10'	20'	30'	40'	50'
1 Burner	1/2" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe
2 Burners	3/4" Pipe	3/4" Pipe	3/4" Pipe	1" Pipe	1" Pipe
3 Burners	3/4" Pipe	1" Pipe	1" Pipe	1" Pipe	1" Pipe
4 Burners	1" Pipe	1" Pipe	1" Pipe	1 1/4" Pipe	1 1/4" Pipe
5 Burners	1" Pipe	1" Pipe	1 1/4" Pipe	1 1/4" Pipe	1 1/4" Pipe

HOT WATER TANK PIPE BURNERS USING NATURAL GAS					
No. of BURNERS	DISTANCE TO REGULATOR				
	10'	20'	30'	40'	50'
1 Burner	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
2 Burners	3/8" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe
3 Burners	1/2" Pipe	1/2" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe
4 Burners	1/2" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe
5 Burners	3/4" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe

HALF TANK PIPE BURNERS USING NATURAL GAS					
No. of BURNERS	DISTANCE TO REGULATOR				
	10'	20'	30'	40'	50'
1 Burner	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
2 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
3 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
4 Burners	3/8" Pipe	3/8" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe
5 Burners	3/8" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe

### LP GAS SPECIFICATIONS

Pressure at Burner: 11 inches of water column  
 Orifice Size on Bluing Solution Tank Pipe Burners: #51 drill  
 Orifice Size on Hot Water Tank Pipe Burners: #53 drill  
 Orifice Size on Half Tank Pipe Burners: #63 drill

#### SUPPLY PIPE DIAMETERS REQUIRED

BLUING TANK PIPE BURNERS USING LP GAS					
No. of BURNERS	DISTANCE TO REGULATOR				
	10'	20'	30'	40'	50'
1 Burner	1/2" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe	3/4" Pipe
2 Burners	1/2" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe
3 Burners	3/4" Pipe	3/4" Pipe	3/4" Pipe	1" Pipe	1" Pipe
4 Burners	3/4" Pipe	3/4" Pipe	1" Pipe	1" Pipe	1" Pipe
5 Burners	3/4" Pipe	1" Pipe	1" Pipe	1" Pipe	1" Pipe

HOT WATER TANK PIPE BURNERS USING LP GAS					
No. of BURNERS	DISTANCE TO REGULATOR				
	10'	20'	30'	40'	50'
1 Burner	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
2 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	1/2" Pipe	1/2" Pipe
3 Burners	3/8" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe	1/2" Pipe
4 Burners	1/2" Pipe	1/2" Pipe	1/2" Pipe	3/4" Pipe	3/4" Pipe
5 Burners	1/2" Pipe	1/2" Pipe	3/4" Pipe	3/4" Pipe	3/4" Pipe

HALF TANK PIPE BURNERS USING LP GAS					
No. of BURNERS	DISTANCE TO REGULATOR				
	10'	20'	30'	40'	50'
1 Burner	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
2 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
3 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
4 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe	3/8" Pipe
5 Burners	3/8" Pipe	3/8" Pipe	3/8" Pipe	1/2" Pipe	1/2" Pipe

The commercial gas heating equipment manufacturer who makes the Pipe Burners for us recommends that the tip of the white cone of the flame should just be "brushing" the bottom of the bluing Tank for total combustion of the gas being burned and the most uniform heat to the bottom of the tank. This usually puts the Pipe Burner about 2" below the bottom of the tank, but we strongly recommend you use an adjustable mounting system so you can adjust the burner up or down once it is in actual operation.

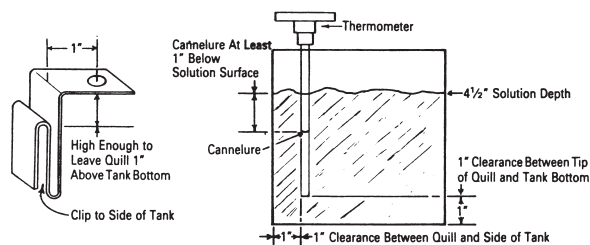
All gas pipe used inside the Bluing Room must be black iron pipe. Copper pipe is attacked by the caustic steam put off by the boiling Bluing Solution, and must not be used inside the Bluing Room.

**THERMOMETER:** A good thermometer is your single most important working tool when operating a Bluing Solution. Glass thermometers should not be used. They break easily, and the mercury or alcohol in them will contaminate the bath, killing its ability to blue. Cooking thermometers should not be used. They are not designed to withstand the Bluing Solution, and frequently the caustic Bluing Solution will seep into the quill (stem) of the thermometer and destroy it. Or, they are alloy or aluminum which dissolves in the Bluing Solution, ruining it. Use only thermometers which are specifically constructed to withstand the high caustic chemical action of bluing chemicals, the thermal shock of rapid heating and cooling, and a maximum temperature range of 350° F.

We carry two different types of bluing thermometers: a traditional tank-mounted model, and a large-dial, remote-reading, wall-mounted model. Each has advantages and disadvantages, so choose the version that fits your shop layout and budget best. You will need 2 - one for the 909 Cleaning Solution Tank, and one for the Oxynate No. 7 Bluing Solution Tank.

When installing the tank-mount model in your bluing tank, you must keep in mind three things. **First**, the thermometer should be mounted in the center of the long side, halfway from each end. **Second**, it should be mounted so the quill has a 1" clearance from the back wall of the tank, and with 1" clearance between the tip of the quill (stem) and the bottom of the tank. There are several ingenious ways to mount the thermometer in this position, however, we like a metal clip like the one shown in the drawing below, to hold the thermometer securely in place.

**Third**, closely examine the thermometer quill, and you will find a groove or cannellure between 2" to 3" from the tip. In order to get correct and accurate readings, this groove (which is the top of the



bi-metal strip inside the quill), must be covered by a minimum of 1" of Bluing Solution when the tank is operating. This necessitates an overall tank depth of 4" to 4½" as the absolute minimum you can work with in your tank and still get accurate temperature readings. Failure to have this groove at least 1" under the surface of the Bluing Solution will result in operating temperatures far in excess of the optimal 292° F, and may well destroy the bath through heat-kill, with actual temperatures over 310° F.

Mount the heat sensor for the remote-reading, wall-mounted thermometer in the same location in your Bluing Tank as described above, for the Bluing Tank mounted model. It should be mounted as nearly vertical as possible to give a reading through the entire depth of Bluing Solution. The tip should be 1" from the bottom and the sensor 1" from the back wall of the tank, and the entire sensor at least 1" below the surface of the Bluing Solution. The sensor must not touch the back or bottom of the Bluing Tank. Wall-mount the dial in a convenient, easy-to-see spot above the Bluing Tank.

**STIRRING PADDLE:** Get yourself a flat iron or mild steel "paddle" to use to stir the salts. Since you'll use this paddle thousands of times over the years to come, make it comfortable to use. An old service station tire iron is ideal. (Any plating must be removed.) You may also want to make a wider paddle, 3" - 4", to use when initially stirring the salts and when there are no guns in the Bluing Solution.

**PARTS BASKETS:** You will want two or more Small Parts Baskets. We recommend lining at least one with black iron screen wire to use for the multitude of small pins, screws and parts.

**BLACK IRON WIRE:** Ideal for hanging parts and actions in the Bluing Tank, and an alternative to the "Z" Hooks described later for barrels.

**STAINLESS STEEL DIPPER:** Used to add water and salts to the Bluing Solution. Properly used, as described under "7), How To Add Water To The Bluing Solution", page 8, it is a safe way to add water to the Bluing Solution.

**RINSE TANK BRUSH:** Made especially to do the best possible scrub job on parts in the Cold Water Rinse Tank immediately following the 909 Cleaning Solution Tank.

#### SAFETY EQUIPMENT:

**Long-Sleeved, Cotton Shirt:** Bluing Salts attacks wool, leather and skin. Wear cotton clothing, and other non-animal fiber clothing when working in your Bluing Room.

**Heavy-Duty, Gauntlet-Type Gloves:** For all work around the Bluing Tank and Rinse Tanks. Get them large enough so you can remove them quickly when hands are sweaty.

**Neoprene Rubber Apron:** Saves clothing and skin. Use it.

**Rubber Boots:** With tops narrow enough to go under your pants legs to keep salts splash out of the boots.

**Full-Face Safety Shield or Goggles:** Simple safety precaution when dealing with any chemical. We recommend the Full-Face Safety Shield.

**Filter Mask:** Wear to prevent inhalation of the dust during mixup of the Bluing Solution and the caustic steam created during operation.

**Jar of Vinegar:** Keep a wide mouth jar of vinegar close to your Bluing Solution Tank to neutralize salts splashes on your skin. Immediately flood affected area with vinegar. Read and memorize warnings on container of Oxynate No. 7 and throughout these instructions.

## CHEMICALS USED IN BLUING

The chemicals listed below are divided into 2 categories: Those that you must have to blue and those that are optional, but extremely useful or helpful, or cure special problems that have arisen. We have made each list alphabetical for your ease in referring back to this section.

### CHEMICALS YOU MUST HAVE

**DICRO-CLEAN 909 CLEANER** - A slightly alkaline detergent cleaner that is formulated particularly for cleaning guns prior to bluing. Removes and puts into suspension all grease, dirt, crud. Strong enough to do the job right, yet when used according to the instructions, it is totally safe to use and harmless to you and the steel you clean in it. In addition, it is totally biodegradable and safe for sewer-system disposal. (Detailed Technical Information On Mixing And Using, page 6.)

**OXYNATE NO. 7 BLUING SALTS** - For over 60 years, the most popular bluing salts for the professional gun trade. Meets Mil Spec C13924BAM1, Class 1, Grade A. Simple to set up and operate, reliable and repeatable in its results. Simply the best gun blue modern science and research can produce. (Detailed Technical Information On Mixing And Using, page 7.)

**WATER** - Strangely enough, clean, clear water is not necessarily safe to blue with, even tho' it might be safe for drinking and household use. When in doubt, use "charcoal-filtered" water, or "ion-exchanged" water. Do not use distilled water unless it has been condensed from steam in glass coils; plants frequently use aluminum or copper coils, both of which leach metallic ions into the water and mess up your bluing. (Technical Information On Water Quality, page 6.)

**WATER DISPLACING OIL** - Specially formulated so the molecules of oil actually displace the molecules of water still on the surface of the gun after it comes out of the hot Water Rinse Tank. Gives the gun a completely protected surface. Water Displacing Oil is also a super rust-preventive, neutralizing fingerprints, plus body acids and oils that get on the gun from handling and shooting after it leaves your shop. (Detailed Technical Information On Setting Up And Using, page 9.)

## CHEMICALS YOU MIGHT WANT TO USE

**BLUING SOLUTION CLEANER** - After prolonged use, all bluing baths get a certain amount of suspended "crud" that is mostly used up and worn-out chemicals and other junk that found its way into the Bluing Bath. This crud does not slow down the bluing action, but it can be an unmitigated nuisance getting into all the hard-to-clean-out places in the guns being blued. It is such a nuisance that frequently operators will dump their Bluing Solution long before it is worn out. Bluing Solution Cleaner extends the working life of the bluing Bath by cleaning up the Bluing Solution and causing the crud to float to the top of the solution where it can be skimmed off easily. Bluing Solution Cleaner does not renew or recharge your Bluing Solution. Its only purpose is to remove accumulated crud from the bath to make it easier to operate.

**Mixing:** 8 ounces of Bluing Solution Cleaner treats 4 to 6 gallons of Bluing Solution (or the amount of solution in a standard 6" x 6" x 40" tank). Add to cold Bluing Solution tank; stir thoroughly as temperature rises to 200° F. Stop stirring after 200° F. When solution boils, skim floating crud off top of solution. Do not add to hot Bluing Solution.

**Caution:** DO NOT use unless tank is very dirty. Bluing Solution Cleaner is a very aggressive cleaner, and if the Bluing Solution does not have enough crud in it to clean out, the Cleaner will clean out good working salts and float them to the top. Don't waste your salts by "overcleaning".

**BLUING SOLUTION NEUTRALIZING SYSTEM** - Due to a number of factors, many municipal and local governments have placed restrictions within their jurisdictions on the disposal of potentially hazardous waste materials, which include depleted Bluing Solution. With this Neutralizing System, in the majority of cases, the disposal of Bluing Solution can be handled in your own shop to comply with all environmental regulations. Complete, detailed instructions are included separately with this Bluing Instructions & Supplies Booklet, and list operating steps and materials required.

**B.O.N.™ - BLEED-OUT NEUTRALIZER** - When used at the proper temperature and dilution, will neutralize any bluing salts remaining on the gun following bluing. Particularly effective for cleaning out salts residue between barrel and frame, or within the gun action, which may eventually bleed out and cause an unsightly and rust-forming rind.

**Mixing:** 6 ounces (by weight) of B.O.N. to 1 gallon of water (check caution on water quality on label). Mixing can be done in tank in which it is going to be used, (Black Iron or Stainless Steel Tank recommended). Make enough to give minimum of 3½"-4" depth in tank. Heat to 130° F. to 140° F. Immerse parts with intermittent agitation for 30 to 45 minutes.

**HOLD™** - Designed for in-shop, rust-free storage of guns and parts following polishing, grinding, sand/bead blasting, prior to bluing. It chemically ties up free oxygen and neutralizes all acidic impurities on the surface of the metal so the metal stays clean and free of the microscopic rust that immediately attacks any cleaned or polished surface. Spray on moderately heavy coating or immerse parts in Hold. Comes off completely in Dicro-Clean 909 Cleaning Solution. Does not contaminate metal. Is non-caustic, non-acid, non-toxic, non-flammable and inexpensive to use. And, it works!

**OXYNATE "S"™** - An important discovery for the entire metal bluing industry. Certain high alloy steels - heat-treated spots on receivers, ejectors, etc., - often come out of the Bluing Solution with a faint red color. Also, many cheaper guns with cast iron frames of very uncertain metal content come out various shades of red or purple. Oxynate "S" added to the Bluing Solution will prevent this from happening in about 80% of the cases when these parts or guns have to be blued. The other 20% of these will cause you problems no matter what you do. When one of these guns comes in, be sure to explain to your customer the possible problems with the metal, and do not guarantee a good, blue-black finish. In some cases, even with Oxynate "S", and no matter what you do, the gun may come out mottled purple.

**Caution:** You must read, understand and follow exactly the instructions for adding Oxynate "S" to your Bluing Solution. If you add it to a brand new solution, or add it to a Bluing Solution while you are mixing it up, you will kill the Bluing Solution completely, and it will not work - period.

**Note:** Our own testing and reports from our customers indicate

the new Oxynate No. 84, designed for bluing stainless steel, does an excellent job of bluing many of the difficult-to-blue cast gun parts. Between Oxynate "S" and Oxynate No. 84 you should be able to blue any of the high alloy or cast steels found in guns. Please contact us for Oxynate No. 84 instructions and information if you are interested in this process.

**PRO-SHEEN** - Brings out the beauty of your polishing and bluing job, and makes the gun really sparkle. Pro-Sheen is a highly-sophisticated, water-soluble, wax compound that has the highly unusual ability of attaching itself to the metal it comes in contact with to form a tough, wax surface. After air drying, the finish is dry, bright and dust-free. Used instead of Water Displacing Oil when a shiny, waxed surface is wanted.

**Mixing:** Mix 1 part Pro-Sheen with 9 parts Pure Water. Mixing can be done in tank in which it is going to be used. (Fiberglass Tank recommended). Make enough to give minimum of 3½"-4" depth in tank. Use at room temperature: 68° F. minimum to 90° F. maximum. Suspend parts taken directly from clean hot water rinse tank in Pro-Sheen, and allow to soak until cooled to tank temperature. Wipe dry with soft cloth. Clean out inside bore, chamber and action thoroughly. Gun is ready for reassembly. Apply coat of good, non-polarized, non-exotic gun oil, like Pro-Tek, to entire gun. If brown scum/precipitate forms on top of tank, skim it off as it is beeswax and neither adds, nor subtracts from the benefits of Pro-Sheen.

**PRO-TEK** - A completely neutral, lightweight, non-additive mineral oil that is ideal to apply to guns following Pro-Sheen. Leaves the guns with the "Pro-Sheen Gloss", but gives added protection - and the right, slightly "oily feel" of protection to the otherwise dry Pro-Sheen finish. (Strangely enough, this feel is desired by most gun owners!) Contains absolutely no additives, nothing to contaminate or damage. Excellent, all-purpose, lightweight lubricant around the shop.

**RUST and BLUE REMOVER or STEEL WHITE™** - Both are formulated to clean off badly rusted parts prior to initial polishing. Or, for removing old bluing from guns, or cleaning up old guns too fragile or time consuming to polish, or cleaning out the rust pits on guns so badly rusted that you would remove far too much metal polishing it. When used properly, they will not attack anything but rusted steel, not the live steel itself. Removes rust, old blue, scale and crud, leaving nothing but bright steel.

**Mixing:** Shipped as concentrate. For Heavy Rust, dilute 1-to-1 with clean water (a 50% solution). For Light Rust, dilute 1-to-3 with clean water (a 25% solution). Immerse parts only until rust is gone. Moderate heating speeds rust removal. Do not exceed 150° F, as components of Rust Remover evaporate out of solution above this temperature. Do not leave parts in for long periods of time. Steel White. For heavy rust mix 10-1 with water. For light rust mix 20-1 with water. Do not heat above 120° F.

## BLUING ROOM SHOPPING LIST

There are many different setups that can be used when putting together a Bluing System. Shops with limited space may very well use a simple, two-tank setup, while others have much more elaborate Bluing Systems that require 4 tanks: Tank #1 - 909 Cleaning Solution (heated); Tank #2 - Flowing Cold Water Rinse; Tank #3 - Oxynate No. 7 Bluing Solution (heated); Tank #4 - Hot Water Rinse (heated).

The Four-Tank Bluing System uses 3 heated tanks, as shown above. The 909 Cleaning Solution Tank, and the Hot Water Rinse Tank can be adequately heated with the Hot Water Pipe Burners. The Oxynate No. 7 Bluing Solution Tank requires the larger, Standard Pipe Burner.

The list below is designed for a 4-Tank System. Modify as necessary for fewer or more tanks.

### HARDWARE

1. Black Iron Tank - **1** - for Oxynate No. 7 Bluing Solution.
2. Black Iron or Stainless Steel Tank - **3** - for Dicro-Clean 909 Cleaning Solution, Hot Water Rinse, and Flowing Cold Water Rinse. (Flowing Water Rinse can be operated very nicely in Fiberglass Tank.)
3. Standard Pipe Burner, complete - **1** - for Oxynate No. 7 Bluing solution Tank.
4. Hot Water Pipe Burner, complete - **2** - for 909 Cleaning Solution Tank and Hot Water Rinse Tank.

5. Fiberglass Tank - 1 - for Water Displacing Oil.
6. Bluing Thermometers, either in-tank or wall-mounted - 2 - for Oxynate No. 7 Bluing Solution and 909 Cleaning Solution.
7. Bluing Parts Baskets - 2
8. Black Iron Screen Wire - 2 - one for each Basket.
9. Black Iron Wire - 1 - coil of 50 feet.
10. Stainless Steel Dipper - 1 - for adding water to the Oxynate No. 7 Bluing Solution.
11. Rinse Tank Brush - 1

#### CHEMICALS

1. Oxynate No. 7 - 2, 40 lb. pails - one to charge the Bluing Tank initially, the second for replenishment.
2. Dicro-Clean 909 - 1, 8 lb. box.
3. Brownells TCE - 1 qt. minimum.
4. Water Displacing Oil - 2 gallons minimum - to create a dip/soak bath at least 3" deep in the Fiberglass Tank.
5. Stop Creep Bar - 1.

#### SAFETY EQUIPMENT

1. Rubber Gloves - 1 pair per operator - style N-44010 recommended.
2. Rubber Apron - 1 per operator.
3. Full Face Safety Shield - 1 per operator.
4. Disposable Filter Mask - 1 per operator - used during mixing of Solutions to prevent dust inhalation.

#### OPTIONAL EQUIPMENT

1. Heat Saver Shields - 1 set per heated Tank.
2. B.O.N. - 1, 8 lb. box.
3. Oxynate "S" - 1 pint - if bluing cast iron steels is anticipated.
4. Bluing Solution Cleaner - 1 pint - use only when Bluing Solution is exceedingly cruddy.
5. Pro-Sheen - 1 quart.
6. Pro-Tek - 1 quart.
7. Neutralizing Kit.

## BLUING STEEL

### TECHNICAL INFORMATION ON WATER QUALITY FOR HOT BLUING

Water that is as chemically pure as possible should be used in the 909 Cleaning Solution Tank, the Rinse Tanks and the Oxynate No. 7 Bluing Solution. There are several sources of water - but each source has its own particular caution, or warning, to keep in mind before using it.

**RAIN WATER** - Excellent if you live away from densely populated areas and the water does not come off a copper-sheeted or zinc-coated roof, and does not run down aluminum or zinc-galvanized gutters and down spouts. In addition, you cannot use rain water that has washed down through industrially polluted air which adds many contaminants to the water. Cannot be stored in copper-lined barrels, galvanized containers or aluminum containers.

**WELL WATER** - Your well or the city's - Generally, fine. But, must not have high alkaline content, and must not have such contaminants as iron, magnesium, copper, molybdenum, lead, and most other metallic ions. In addition, if you are in an agricultural area where heavy irrigation or fertilization is used, your ground water probably has high nitrate levels, which can mess up the chemical balance of the Bluing Solution, and may spot the blued guns in the Hot Water Rinse, or B.O.N. Rinse Tanks.

**RESERVOIRS OR IMPOUNDMENTS** - Generally, fine. But, watch for all the contaminants listed above, as well as direct surface runoff from ag land. In addition, copper sulphate is a particular problem in these water sources, because it is used to kill the algae that grows so heavily in the water during the summer, as well as to clean out the delivery mains. The further south you go, the heavier the algae growth, and the more common it is to have the water treated heavily with copper sulphate one or more times a year. Suspect your water supply is contaminated if your Bluing Solution kills suddenly and unexpectedly, or seems to die too quickly during use. Remember, it only takes a few parts per million of copper to kill the Bluing Bath.

**STREAM/RIVERS/CREEKS** - Sometimes fine. Most frequent prob-

lems reported with water pollution have been from these sources. Particularly susceptible to contaminants listed above, in addition to many more industrial ones that don't get into ground water or reservoirs. Plus, real problems with runoff from mine tailings and ag land.

**DEHUMIDIFIER WATER** - Badly contaminated with aluminum from the condenser coils as well as crud from the high volume of air that goes by the coils. Do Not Use.

**WHAT TO DO?** - Generally, straight-up tap water will give satisfactory results as your main water source for your bluing room. However, if you suspect the water is causing problems, you have several options. **1)** Use "charcoal-filtered" water, or "ion-exchanged" water. Do not use distilled water unless it has been condensed from steam in glass coils; plants are frequently using aluminum or copper coils, both of which leach metallic ions into the water and mess up your bluing. **2)** Purchase a water "Taste & Odor" filter from Sears and run all the water used in your bluing operation through it. It's a big charcoal filter, and usually cleans up contaminated water successfully. We've been recommending it for several years with great success by the shops who use it. **3)** Rent, lease or purchase a Culligan, or similar, water treatment system using a reverse-osmosis filtration system. These frequently filter only a little water per day, so saving/storage systems must be considered. Most are moderately expensive to rent, very expensive to buy. In extremely bad water areas, they may be the only way for you to get water good enough to use.

### TECHNICAL INFORMATION ON MIXING & USING DICRO-CLEAN 909 CLEANING SOLUTION

As least 50% of the problems beginning gun bluers contact us about are directly traceable to improper cleaning - or the use of incorrect cleaners. As in other professions, "Cleanliness Is Next To Godliness", and it really holds true in bluing. So, follow these instructions carefully.

**1)** Determine the size tank you wish to use and the volume of solution you wish to put into it. Calculate the volume capacity of a tank by multiplying the inside length x inside width x desired depth and divide the answer by 231 (the number of cubic inches in a gallon). The answer you get will be the capacity of that tank in gallons. As a rule of thumb, the Brownell Black Iron or Stainless Steel Tank, measuring 6" x 6" x 40", holds 6 gallons of solution; 4" of depth equals about 4 gallons of solution.

**2)** Mix only enough Dicro-Clean 909 Cleaning Solution as you need to provide good depth in your tank. It is cheap to use, so don't stint; however, you do not need a full tank if you are doing only a few guns. We recommend a minimum of 3-4 gallons to ensure enough depth and volume, plus accurate temperature readings on the thermometer.

#### TO MIX ONE GALLON\* OF HOT DICRO-CLEAN 909 CLEANING SOLUTION -

**MIXING RATIO:** 5 oz. by weight (approximately 2/3 cup by volume) of Brownells Dicro-Clean 909 Cleaner per gallon of clean water.

**OPERATING TEMPERATURE:** Heat to 180° F. and stabilize temperature. Do not boil.

**IMMERSION TIME:** Suspend parts for 10 to 15 minutes.

\*Note: You must multiply the formula for "One Gallon" by the number of gallons of Cleaning Solution you wish to make and put into your Cleaning Tank, [See "1)" above].

**3)** Remove the parts from the Cleaning Tank and place in the Cold Water Rinse Tank. Scrub well with the rinse Tank Brush or a stiff-bristled vegetable brush. When thoroughly scrubbed, examine the parts under a strong incandescent light for signs of "puddling" around screw holes, barrel rings, etc. If no oil slick, beading up or puddling appears, the parts can be assumed to be clean. If beading or an oil slick is present, return the parts to the Dicro-Clean 909 Cleaning Solution Tank for another 2 to 4 minutes of soaking. Then, repeat the examination for dirt and oil. It is very important that the parts be clean. Do not put parts into the Bluing Solution Tank that are not absolutely clean.

After being cleaned in Dicro-Clean 909 Cleaning Solution, steel parts are chemically clean. Do not allow the parts to stand in open air or remain in water for longer than is absolutely necessary. The oxygen in air and the free oxygen in water will attack the steel and cause it to rust very rapidly. This rust might not be evident to the naked eye, but will show up as silver specks on the surface of the steel after the gun has been blued. In fact, they may not show up for several days.

No need to rush through the Cold Water Rinse Tank, but do not leave the parts in the tank any longer than required to do a good job of scrubbing.

Once the parts are clean, they are put into the Oxynate No. 7 Bluing Solution Tank for Bluing. That step is covered below.

**DO NOT: #1)** Do Not use lye or other very caustic cleaners. Over-exposure of metal to these cleaners puts a slight etch on the metal which will show up as unwanted, bright, white specks after the gun has been blued.

**DO NOT: #2)** Do Not use gasoline, kerosene, naphtha products, alcohol, MEK, acetone, paint thinner, tri-sodium phosphate or similiar industrial or household cleaners to clean guns prior to bluing. Many leave residues, oil or contaminants on the surface of the metal that result in gray streaks in the final blue job; others simply do not clean off oils and greases. Use Dicro-Clean 909; it works. These others have all caused trouble for us and/or bluing customers in the past.

**DO NOT: #3)** Do Not try to get too much mileage out of your Dicro-Clean 909 Cleaning Solution. It MUST be dumped and replaced daily. And, if you are doing a lot of guns - or some very cruddy guns - you should replace it more often. If you try to keep it over to the next day, it gets the consistency of pudding, and quits cleaning. Simply dump it daily and start with a fresh bath. Save yourself some blood and tears! Your 909 Cleaner is one of the cheapest components used in bluing.

### TECHNICAL INFORMATION ON MIXING & USING OXYNATE NO. 7 BLUING SOLUTION

Most of the rest of the problems we are contacted about with bluing have to do with the proper operation of the bath, and the whole process of temperature control, which is directly tied to the concept of "supersaturation", the principle on which the Oxynate No. 7 Bluing solution works.

Before going any further, it is quite important that you understand this principle. All the modern "heat bath" bluing solutions are operated at what is known as "supersaturation level". If you understand this one point, your handling of Oxynate No. 7 during the years to come will be vastly simplified - making you an expert on the subject - something we want all Brownell Customers to be.

**SUPERSATURATION:** is most easily understood by an example. Take a cup of water, put it in a pan and place it on the stove without heat. Now, start adding plain table salt and stirring. You will find that you can only dissolve so much table salt in the water. If you turn on the heat, you will discover that as the water heats up, more and more salt can be dissolved. As more salt dissolves in the water, the boiling point of the salt/water solution goes up beyond 212° F., which is the boiling point of pure water at sea level. The hotter you get the solution, the more salt you can dissolve in it, and the higher the temperature at which it boils.

This is "supersaturation". If the salt/water solution is allowed to cool, the salt goes out of the solution as the temperature drops and settles to the bottom of the pan as crystals.

Oxynate No. 7 operates in exactly the same manner. In order to get enough bluing chemicals into solution with water to turn the steel blue-black in color instead of some other color, the water has to be heated to make more Bluing Salts go into the solution. When the level of supersaturation is such that the boiling point of the Bluing Salts/water solution is 292° F., the solution has the proper chemical balance of Bluing Salts and water to produce a blue-black colored finish on steel. If the boiling point of the Bluing Salts/water solution is much lower than 292° F., (remember, all temperatures are at sea level for this discussion!), a gray color will develop on the gun. If the boiling point goes much above 292° F., (say in the 300° F. range), a red color develops on the gun. This is not rust, but the result of too much concentration of bluing chemicals in the water, which produces a red color instead of the desired blue-black color.

As you can see then, temperature control of the Bluing Bath is extremely critical. You actually use the boiling temperature (point) of the Bluing Bath as your "gauge" to tell you whether the chemical concentrations of the Bluing Salts and water are correct to give you a blue-black color on the steel you put into the Bath. If you screw up on temperature control, you will definitely *not* get the colors you want, or a blue job that is nowhere near the color and quality the Bluing Salts are able to produce. We will cover temperature control in much more detail below.

**1) DETERMINE THE SIZE TANK** you wish to use and the volume of solution you wish to put into it. Calculate the volume capacity of a

tank by multiplying the inside length x inside width x desired depth and divide the answer by 231 (the number of cubic inches in a gallon). The answer you get will be the capacity of that tank in gallons. As a rule of thumb, the Brownell Black Iron or Stainless Steel Tank, measuring 6" x 6" x 40" holds 6 gallons when completely full. Thus, 1" of depth equals about 1 gallon of solution; 6" of depth equals about 4 gallons of solution.

**2) REVIEW THE SECTION IN "THERMOMETERS"** and understand that you must have at least 4" of solution in your tank just to be able to correctly determine the temperature using our thermometers. Additional depth is not a problem; shallower than 4" will definitely cause you trouble. We recommend a minimum of 3½-to-4 gallons to ensure enough depth and volume, plus accurate temperature reading on the thermometer.

**3) ALWAYS MEASURE WATER AND WEIGH DRY CHEMICALS.** Guessing will lead to wasted time bringing the Bluing Solution into correct operating balance later. The mixing ratio is 10 pounds of Oxynate No. 7 to 1 gallon of water. Practically, however, we recommend that you mix the Bluing Solution as given in the instructions, using less water. This brings the Bluing Solution to a vigorous rolling boil more quickly and at a lower temperature (because the salts concentration is lower, the boiling point is lower). When the bath begins to boil, simply add salts, and stir in. The boiling will stop immediately. When it starts to boil again, add more salts. Continue to do this until the proper 292° F. + or - temperature is reached.

**4) STABILIZING BLUING SOLUTION TEMPERATURE.** When you start heating the Bluing Solution, one of two things will happen: (1) the Bluing Solution temperature will reach 292° F., without yet having reached a vigorous rolling boil. Or, (2) the Bluing Solution will boil vigorously below the operating temperature of 292° F.

In situation (1), which is what usually happens, you have too much Bluing Salts in the Bluing Solution ratio. To cure: simply add small amounts of additional water to the Bluing Solution to dilute the concentration of Bluing Salts and stabilize the boiling temperature at 292° F. If the addition of the water raises the level of the Bluing Solution too high in the tank, leaving you less than 1" to 1½" between the top of the Bluing Solution and the lip of the tank, you will have to dip out excess Bluing solution in order to make room in the tank for the required amount of water. The easiest way to do this is to dip the Bluing Solution out with your stainless steel dipper into a heavy, plastic bucket with a tight lid. This allows you to save it to be added back into the Bluing Tank at a later date to replenish the Bluing Solution lost through drag-out.

In situation (2), you have too much water in the Bluing Solution ratio. You have two cures: A) Allow the Bluing Solution to continue boiling until the temperature has risen to 292° F. For instance, if you mix the Bluing Solution with a ratio of one gallon of water to 10 pounds of Bluing Salts, the Bluing Solution may easily begin boiling at 265° F., and you may have to wait quite a while for the excess water to boil out and the temperature to rise and stabilize at the required 292° F.: B) Add enough additional Bluing Salts to the Bluing Solution to increase the Bluing Salts-to-water ratio which will permit the temperature to rise and stabilize at the required 292° F. If the addition of the Bluing Salts raises the level of the Bluing Solution too high in the tank, leaving you less than 1" to 1½" between the top of the Bluing Solution and the lip of the tank, you will have to dip

#### TO MIX ONE GALLON\* OF OXYNATE NO. 7 BLUING SOLUTION

**MIXING RATIO:** 10 pounds of Oxynate No. 7 to 1 gallon of water.

**YIELD:** Approximately 1.1 gallons of Bluing Solution by volume.

**OPERATING TEMPERATURE:** A vigorous rolling boil full length of the Bluing Tank at 292° F.

**IMMERSION TIME:** Maximum penetration is complete after 30 minutes.

\*Note: You must multiply the formula for "One Gallon" by the number of gallons of Cleaning Solution you wish to make and put into your Cleaning Tank, [see "1" above].

out excess Bluing Solution in order to make room in the tank for the required amount of Bluing Salts. The easiest way to do this is to dip the Bluing Solution out with your stainless steel dipper into a heavy, plastic bucket with a tight lid. This allows you to save it to be added back into the Bluing Tank at a later date to replenish the Bluing Solution lost through drag-out.

**a)** Measure out 3½ quarts of cold water [See #3) above] and put into Bluing Tank. Do NOT turn on heat source.

**b)** Slowly add 10 pounds, by weight, of Oxynate No. 7 to the cold water in the Bluing Tank. Stir as you add Bluing Salts. Continue

stirring as Bluing Salts dissolve to speed action and remove any entrapped pockets of cold water that could erupt from heat generated by chemical reaction of the Bluing Salts and water. Repeat adding water and salts in this mixing ratio until the bath is at the proper level.

c) When chemical heat generation stops, turn on heat source. Stir the bath thoroughly every one to three minutes until the temperature reaches 292° F., or the bath shows a full, heavy rolling boil, whichever comes first.

d) Stabilize temperature at 292° F. [See #4) above]. Stir thoroughly. Review "4) Stabilizing Temperature" section thoroughly. Very critical. You must understand and do - or you will destroy this Bluing Bath!

e) When the Bluing Solution is fully stabilized and boiling vigorously the full length of the Bluing Tank, stir thoroughly again. (If you are not using our Pipe Burner as your heat source, you may have to adjust the flame height in order to avoid creating too vigorous, or too violent, a boiling action. Should your Bluing Solution tank be boiling very violently with spitting and splattering of the Bluing solution, you will have to turn the gas down just a little. Be sure to maintain a vigorous rolling boil, however. We have more problems with operators turning the gas down too far and reducing the vigorous, rolling boil to an easy, gentle boil than any other problem in the bluing cycle. You simply will not get the best blue color possible with an easy, plopping, gentle boil, although you may get acceptable color on some metals.

**5) AMOUNT OF BLUING SALTS REQUIRED.** A standard 6" x 6" x 40" Black Iron Bluing Tank filled to a depth of a little over 4" requires approximately 35 pounds of Oxynate No. 7, leaving you little for replenishment. Therefore, we recommend you purchase 2 pails of Oxynate No. 7 when you start up your bluing operation.

**6) TEMPERATURE CONTROL OF THE BLUING SOLUTION** - The single most common cause of trouble for the beginning gun bluer is not understanding the absolute importance of maintaining temperature control - and how to do it.

If you fully understand the principle of "supersaturation" described above, you will see that as the temperature of the Bluing Solution rises above 292° F., it can be brought down by adding water. If the temperature is too low (below 292° F.), it can be raised back up to 292° F. by allowing water to boil out of the Bluing Solution or by adding more Bluing Salts to the Bluing Solution. In other words, the key to temperature control in the Bluing Solution is to closely monitor the temperature and add water or Bluing Salts, or let water boil out to maintain the optimum operating conditions of a vigorous, rolling boil at 292° F.

Because the Bluing Solution operates at a vigorous boil, which creates a lot of steam, it is constantly losing a lot of water, and the temperature will consistently rise - unless you frequently add water to the Bluing Solution. Therefore, ADD WATER FREQUENTLY TO THE BLUING SOLUTION. If you do not, the temperature will rise, the Bluing Solution will go out of the correct chemical balance to turn the guns blue-black, and will instead, at the higher temperatures, turn the parts red, or shades of red.

**DO NOT:** Do Not ever try to control the operating temperature of your Bluing Solution by just turning the heat source up or down.

**Temperature Adjustment For Altitude** - The optimum operating temperature for an Oxynate No. 7 Bluing Solution is 292° F. at sea level, and altitudes up to about 4000 feet. Customer experience has shown that at about 5000 feet (Denver), the Bluing Solution operates best about 5° F. lower, in the 287° F. range. Higher altitudes require lower temperatures, and the operating temperature can be lowered approximately 1° per each 1000 to 2000 feet above 5000 feet.

**7) HOW TO ADD WATER TO THE BLUING SOLUTION** - Water should be added with caution. It is best accomplished by using a long-handled dipper; an old-fashioned porcelain enamel drinking dipper is fine, as is our Stainless Steel Dipper. **DO NOT** use plastic, aluminum or unknown alloys; they can disappear in the Bluing Solution and kill its ability to blue guns. To add water to the Bluing Solution, fill the dipper about ¾ full of clean water and immerse it in the Bluing Tank near one end until the lips of the dipper are flush with the top surface of the Bluing Solution. Then, tipping the dipper bowl toward the near end of the Bluing Tank, gradually pour the water out of the "back" of the dipper, at the same time sweeping the dipper full-length along the top of the Bluing Solution. Putting water into the Bluing Solution this way will avoid hot Bluing Solution flowing into the bowl of the dipper which can cause excessive splattering and eruptions.

**DO NOT:** Have cold water "drip" into the Bluing Solution at one end,

or try to set up an automatic water replenishment system without first having a knowledgeable, professional, manufacturing plant engineering department install a full-time automatic agitation/stirring system. As the cold water enters below the surface of the hot Bluing Solution, it is immediately surrounded by super-heated liquid which instantly changes that cold water into steam with a volume some 700 times that of the water it came from. This steam has to escape, and will erupt violently, frequently "blowing" hot Bluing Solution all over the operator and the bluing room. The industrial "horror stories" of this happening are graphic and tragic. It is a stupid thing to do. **DON'T ADD WATER WITH AN AUTOMATIC SYSTEM.**

**8) STIRRING THE BLUING SOLUTION** - The Bluing Solution must be stirred to break it up at the beginning of each bluing session, and it must be stirred frequently during the bluing cycle. Because the heat is applied to the bottom of the Bluing Solution Tank, the Bluing Solution naturally stratifies in the Bluing Tank into heat layers which are several degrees warmer at the bottom just above the heat source than they are at the top. A study done on this under very controlled laboratory conditions showed that only as little as ½" vertical distance was needed to get different temperature strata when the bath was not stirred. This could easily result in red color to appear on the bottom of a piece in the Bluing Tank, while further up the piece, the correct blue-black color was achieved. Therefore, **STIR THE BLUING SOLUTION FREQUENTLY - EVERY 2 TO 3 MINUTES - ESPECIALLY WHEN THERE ARE PARTS IN THE BLUING TANK**. In addition, agitate the barrels, actions, small parts baskets, etc., up and down frequently. This does not replace stirring; it helps keep fresh, active Bluing Solution on the surface of all the parts in the Bluing Solution Tank. If you do not "Stir & Agitate", expect discoloration, uneven temperatures, and sub-standard bluing jobs.

**9) ADDING BLUING SALTS TO THE BLUING SOLUTION** - When it is necessary to add Bluing Salts to the Bluing Solution, it should be done between jobs when there are no parts in the Bluing Tank, or at the beginning of the session when the Bluing Solution is being brought up to operating temperature. Bluing Salts generally have to be added to replenish those that are "dragged-out" when guns and parts are removed from the Bluing Solution. Also, as Bluing Salts wear out, or "deplete", they must be replenished. And, when the level of the Bluing Solution in the Bluing Tank becomes too low to properly cover the parts you are bluing, or properly cover the stem of the thermometer, Bluing Salts must be added.

Finally, applying the principle of supersaturation: If you can raise the temperature of the Bluing Solution by letting water boil out (which increases the Bluing Salts part of the Bluing Salts/water ratio), then it stands to reason that you can add additional Bluing Salts to the Bluing Solution and accomplish the same temperature rise. [See #4) above.]

**10) RED SMUT AND BLACK SMUDGE** - Both of these problems are the result of improper operating procedure. If the Bluing Solution is allowed to go over 300° F., a red coloring may form on the steel. If it goes above 310° F., a red "smut" will form. This is the natural result of the chemical action of the Bluing Salts/water ratio found at these temperatures, and will not happen if you control the temperature correctly.

A sort of "black smudge" may form on the steel if the Bluing Solution is allowed to boil in a wild, and far too vigorous, manner at 292° F. However, too mild a boil can cause gray streaks and serious discoloration. Maintain a vigorous rolling boil (just below spitting level) the full length of the Bluing Tank at all times.

**11) CLEANING THE BLUING SOLUTION AND BLUING TANK** - After prolonged use, two very obvious things happen to the Bluing Solution Tank and the Bluing Solution:

a) Bluing Solution is splattered on the inside edges of the Bluing Tank and forms a crust. Plus, capillary action brings cold Bluing Solution up onto the sides of the Bluing Tank above the level of the Bluing Solution. This causes no harm, but is most unsightly and messy. However, usually if these Bluing Salts are still white in color, they are still "good" and should not necessarily be cleaned off and disposed of. If the Bluing Salts on the side of the tank are badly yellowed, or have turned brown or deep brick red in color, they may be depleted and should be cleaned off. To remove, wait until the Bluing Solution is cold and has stood for a day, then hold a piece of stiff cardboard over the Bluing Solution and against the sides of the Bluing Tank. Using a putty knife, scrape the crust and crud off onto the cardboard and dispose of it safely.

b) As the Oxynate No. 7 Bluing Solution is used, fine granules

or flakes of depleted Bluing Salts form in the Bluing Solution and circulate through the Bluing Solution during operation. They do not affect the bluing action, but they certainly can clog the screens of the Parts Basket, and pack inside barrels, small milled-out sections of frames, actions and other parts. When this accumulation of depleted Bluing Salts becomes more problem than it is worth to clean out the parts after taking them out of the Bluing Solution, we recommend the use of Bluing Solution Cleaner. This product suspends the crud and floats it to the top of the Bluing Solution where it can be skimmed off with a strainer and disposed of.

**DO NOT:** Remove the normal crust that forms on the surface of a cold Bluing Solution. These are good Bluing Salts and the usual way Bluing Salts get when cold. Leave it alone. Just be sure to break it up each time before turning on the heat under the Bluing Tank.

Rust in your Bluing Tank will do no particular harm. For looks, however, when you have dumped the Bluing Tanks, work them over with a stiff steel brush to clean them up. Under no circumstances coat the inside of your Bluing or Rinse Tanks with anything whatsoever. Let them rust . . . the paint or rust inhibitor you put on that surface will ruin any bluing job you try to run through those tanks!

**12) COVER BLUING TANKS WHEN NOT IN USE** - Keeping the Bluing Tanks covered when not in use is very important for several reasons. In humid weather, the Bluing Salts in an uncovered cold Bluing Tank will draw moisture from the atmosphere. When you reheat the Bluing Tank, you will have to boil out the extra water gained to get the Bluing Solution to operating temperature, and this can take a long time. Worse yet, the moisture absorbed frequently brings with it carbon dioxide found in the air, which, when combined with the water in the Bluing Solution, forms carbonic acid that can completely neutralize your Bluing Solution in a short time.

Keeping the Bluing Tank covered also keeps general junk from falling into the Bluing Solution, keeps cats and critters out, and prevents the possibility of someone accidentally getting into the Bluing Solution.

A top-quality, heavy-gauge steel cover with an airtight rubber gasket is shown in the catalog section of these instructions.

A good, practical cover can be made by spreading a couple of layers of heavy 6-mil builders' plastic over the top of the cold Bluing Tank with a heavy piece of soft fiberboard or similar material laid over that. Over the fiberboard, place an oversized piece of ¾" plywood and weigh the whole works down with a couple of cement blocks to help get a tight seal on the top edge of the Bluing Tank. The tighter the seal, the greater the chances of controlling the unwanted contamination. (Note: While the Bluing Tank is being operated, the carbonic acid that forms is absorbed by the steam generated by the vigorously boiling Bluing Solution, and is carried off into the air with no harm to the Bluing Solution.)

**13) STORING THE BLUING SOLUTION** - Leave the Bluing Solution in the Bluing Tank - and cover it as described above. It will neither attack the metal the Bluing Tank is made of, nor be affected by constant exposure to the Bluing Tank. The Bluing Solution should always be covered after it is cooled down, [See #12] above].

**14) STORING NEW, UNUSED OXYNATE NO. 7** - We do not recommend long-period storage of unused Oxynate No. 7 unless the storage container is completely and totally airtight. If protracted storage is expected, the Oxynate No. 7 Bluing Salts should be put inside a plastic container (not left in the metal shipping bucket), sealed tight, and this container placed inside a metal container that can be tightly sealed. All must be airtight. Store in an area that has a constant temperature from summer to winter, and do not set directly on a concrete floor. You want to avoid cooling and heating of the sealed containers to prevent them leaking air, and when the temperature changes, sucking in air and atmospheric moisture. This leads to carbonic acid formation, and the eventual neutralization or killing of the new, unused salts just from sitting around.

It is better not to buy Bluing Salts unless you are going to use them soon.

**15) WHEN TO DISPOSE OF A BLUING SOLUTION** - Under normal operating conditions, your Bluing Solution will start to show a faint red cast when it is starting to "wear out". Also, you will notice that it takes longer than usual for a gun to take on the expected beautiful, deep, blue-black color. Addition of fresh Oxynate No. 7 to a Bluing Solution that has already taken on a red cast is not recommended as the Bluing Solution generally is already past saving. However, it may be worth trying to clean the Bluing Solution with Bluing Solution

Cleaner. If it removes the red cast, you can re-build the Bluing Solution with the addition of fresh Oxynate No. 7. If the red color remains, the Bluing Solution probably is not salvageable.

Because the life of a Bluing Solution varies greatly from shop to shop, depending on a whole lot of variables, the best answer is to dispose of the Bluing Solution when it quits bluing!

**DO NOT:** dispose of the Bluing Solution just because the liquid portion has taken on a reddish color. Many areas of the country have iron or other metallic ions in the water that turn the Bluing Solution reddish without affecting its operation. WHEN THE BLUING SOLUTION IS BRICK RED - AND STOPS BLUING CORRECTLY - IT IS DEAD AND SHOULD BE DISPOSED OF PROPERLY. UNTIL THEN, KEEP USING IT; DON'T FIX WHAT AIN'T BROKE!

**DO NOT:** dispose of Oxynate No. 7 Bluing Solution carelessly. Carefully read and understand the complete, detailed instructions for neutralizing and proper disposal included separately with this Bluing Instructions & Supplies Booklet and every can of Oxynate No. 7. If you have mislaid these disposal instructions, contact Brownells for another set.

## TECHNICAL INFORMATION ON SETTING UP & USING WATER DISPLACING OIL

The Oil Tank is the final step in the bluing operation, and one of the most critical if your bluing job is to last once it is returned to the customer. We highly recommend Water Displacing Oil as the oil you use because it is formulated to actually remove all the water on the blued parts, molecule by molecule, and replace it with the oil; hence the name "Water Displacing Oil". In addition, Water Displacing Oil helps neutralize any Bluing Solution residue that may still be on the metal, and gives an amazingly tough, rust-resistant finish to the new blue. Also, pure, non-additive, non-detergent mineral oil can be used, and *must* be used over Pro-Sheen. Oiling is done following the Final Hot Water Rinse to give the best protection to the finished gun.

For the dry and shiny look preferred by some shooters and hunters, you can use Pro-Sheen, a hard, dry, wax finish that has amazing affinity for sticking on metal. This product is fully discussed in the "Chemicals You Might Want To Use" section, page 5.

**DO NOT:** #1) Do Not heat the tank of oil. We don't care who told you to use "hot oil", you're a damn fool about to burn down your shop if you heat a tank of any oil you can conceivably buy on the industrial or commercial market. DON'T DO IT!

Water Displacing Oil must be used at room temperature. It MUST NOT BE HEATED for any reason, at any time, ever! It has a flash point of 150° F., very close to that of kerosene. Other oils are not intended to be heated by an outside heat source either, and should not be. Even "quenching oils", which have a higher flash point, and do not flame when only small quantities of heated metals are plunged into a large, cold volume of them, will ignite when heated by an outside source.

**DO NOT:** #2) Do Not use any of the new exotic rust removing oils (those highly touted ones in the magazines) on brand-new bluing, because these oils 'see' the bluing as "surface rust", and try to penetrate and remove it. They partially succeed, which lightens the color of the new bluing by removing some of it. They also generally streak, stain and damage new bluing until it has set up thoroughly. Especially avoid WD-40 on 'virgin' bluing. After the bluing has 'cured' for a few days, it is then perfectly safe and advisable to use the modern wonder oils, if you wish.

**DO NOT:** #3) Do Not lay guns or parts on the bottom of the Water Displacing Oil Tank. As the water is removed from the guns, it settles to the bottom of the tank with the Water Displacing Oil floating on top of it. Use racks in the tank to keep the guns off the bottom. Many 'smiths install a radiator drain cock in the bottom of their oil tanks to periodically drain off the large quantities of water that accumulate.

**DO NOT:** #4) Do Not try to save the used up remains of Water Displacing Oil when it gets too thick and "solidified" for efficient use. Consider it "used up", and replace with new. Trying to save it by diluting with solvents will change the predictability of penetration and protection.

After immersion, the guns and parts are set on a wire mesh-bottomed shelf directly above the Oil Tank so the extra oil drips back into the tank. Keep the Oil Tank tightly covered when not in use, and keep away from open flames.

**OPERATING INSTRUCTIONS**

The following information is included here before we get into the actual operation of the Oxynate No. 7 Bluing Solution to save you lots of grief and mistakes. If you blued long enough, you would probably find out all of these things through experience; but we think the more knowledgeable you are before you start, the more proficient you will be with your first job, and the more satisfactory and satisfying bluing will be for you. For many more Kinks® on bluing - far too many to include in a booklet of instructions - be sure to order Volume I, Volume II, Volume III and Volume 4 of *Gunsmith Kinks*® which include the suggestions and findings of gunsmiths the world over.

**1) BLUING ALUMINUM, BRASS AND STAINLESS STEEL** - DO NOT attempt to blue any aluminum or brass parts, including but not limited to, chokes, sights, ribs, frames, or gun parts. The Oxynate No. 7 Bluing Solution will immediately dissolve them, and the now-dissolved aluminum will completely ruin the bluing bath for use on other guns because the dissolved aluminum is "false-plated" onto the gun metal in the form of lots and lots of little random, white, 'silver' gray spots that have to be polished off to be removed. This also happens with all non-ferrous metals, pot-metals and their alloys.

Stainless Steel will not turn blue color in the Oxynate No. 7 Bluing Solution. We recommend Oxynate No. 84 for bluing Stainless Steel parts and most cast iron gun parts. Please contact us for the Oxynate No. 84 Instructions; it gives excellent results.

**2) FOAMING OF THE BLUING SOLUTION** - The newly mixed Oxynate No. 7 Bluing Solution may foam the first time or two it is used if you have a water condition that has slightly contaminated the Bluing Solution. Foaming is not expected, nor is it considered normal, but it sometimes happens. Check the section "Technical Information on Water Quality" and possibly use a different water source. Foaming that starts unexpectedly during later bluing operations may indicate that you have put an aluminum or pot metal piece into the Bluing Solution, in which case the Bluing Bath and the parts are being ruined. Remove all metal from the Bluing Solution Tank and check immediately.

When foaming does occur during the first runs of the new tank, and you have eliminated the possibility of aluminum or pot metal causing it, stir the bath vigorously, let the crud/foam form on the top of the Bluing Solution and skim it off for disposal. Generally, the foaming will stop soon, and you can go ahead with the bluing. It is not advisable to place guns in the Bluing Tank when it is foaming heavily, because of the likelihood there is serious contamination of the Bluing Solution occurring that might damage the guns you put into the tank.

**3) DON'T PLUG THE BORES** - Tests were run by the government at the Rock Island Arsenal several years ago on a series of blued bores to compare them to unblued bores. With this hot bluing solution method of gun bluing, it was found that the blued bores gave longer barrel life and better muzzle pressures - very slight, of course, but it proves there is no need to plug the bores of barrels being blued to protect them. Furthermore, modern caustic Bluing Solutions operate at such super heated temperatures that they rapidly expand the air trapped in the barrels causing the plugs to blow out with very explosive results, splattering hot caustic Bluing Solution over you and the shop. **PLUGGING THE BORES IS VERY DANGEROUS. DON'T DO IT!**

**4) DISASSEMBLE THE GUN COMPLETELY** - Before bluing, the gun should be completely disassembled; any part that can come off should be removed. Parts may actually "corrode" together if left in place, and because of the high operating temperature, springs left in the gun may easily have their temper ruined. You want to present your customer with a "clean, functioning gun, just like, or better than, new". The only way to accomplish this is by complete disassembly. (Note: In many cases it is quite permissible and usual to leave the rifle, shotgun or revolver barrel attached to its action.)

**5) BLUING CAST IRON GUNS** - Frequently, cheap, single or double barrel shotguns, dresser-drawer pistols and some early-model rifle frames were made from cast iron, or at the very least, steels whose actual content and parentage was greatly in question. Generally, these blue to some extent, but almost universally take on a red/purple

color that is most unacceptable to you and your customers. Oxynate "S" was developed to be added to the Oxynate No. 7 Bluing Solution to help combat this red/purple color, and give you a more acceptable blue/black color. In addition, Oxynate No. 84 Bluing Salts, while developed for bluing Stainless Steel, have proven to do a remarkable job of bluing cast iron and other questionable steels. We highly recommend either product.

**Note:** Frequently, a lower-priced gun that is casehardened, or color-casehardened rather than blued, is an indication that the gun might be made from cast iron. Watch for these in your bluing, and be prepared to have to do the extra steps to keep them from turning red.

**6) BLUING COLOR-CASEHARDENED GUNS** - Casehardening must be removed before bluing, because if you attempt to blue frames or parts that have been casehardened without first completely polishing and buffing off the casehardening, the gun may come out of the Bluing Solution with a heavy, tough, green or yellow scum on the surface of the casehardened parts if the underlying gun was steel. If gun was cast iron, the scum or discoloration will probably be mottled red/purple.

You can identify casehardening on the surface of the gun by its typical mottled gray/blue color. If the colors have worn off, you will be able to tell it is casehardened when you start to polish it on your buffing wheels. And, you will be able to tell, too, when you have polished through the casehardened surface by the changed look of the metal. Casehardened metal polishes "bright and slick". As you polish through the casehardening, the metal surface takes on a normal "polished appearance". Once you've done it, you will see exactly what we mean. Also, experience will teach you which guns you can expect to be casehardened.

Oxynate "S" in the Bluing Solution, along with proper and complete polishing, helps ensure an excellent bluing job on previously casehardened surfaces. **CAUTION: PROPER AND COMPLETE REMOVAL OF THE CASE HARDENED SURFACE BY POLISHING IS VITAL.**

We have also discovered that Oxynate No. 84 did an excellent job of bluing an old casehardened Savage Model 311 without any extra-careful polishing off of the old casehardening. We just cleaned up the surface, knocked off the "color" of the casehardening, and blued it in Oxynate No. 84. Came out great!

**7) TWO-TONE FINISHES** - Some guns are duplex-hardened or have other special treatment of the metal on a single piece. The slide on the Colt 1911 Auto is a classic example. When this slide is removed from the Bluing Solution, rinsed and then examined under a bright light, the area around the slide stop notch and the front of the slide will be of a slightly different "color tone" than the balance of the slide. Frequently, if these parts are left in the Bluing Solution for an additional 30 minutes, the color match throughout the part will improve. Also, when they have been oiled and allowed to "cure" for several days, the slight difference in color will practically disappear. This "two-toning" happens on several guns on the market, so don't panic when you run into it.

**8) BLUING DOUBLE BARREL SHOTGUNS OR GUNS WITH SOFT SOLDERED RIBS** - We recommend that you don't do it in Oxynate No. 7 Bluing Salts. We do recommend you use Dicropan IM™ for Doubles, the instructions for which are given later.

The problem in bluing with Oxynate No. 7 is two-fold: First, the air trapped between the barrels by the soldered-in rib will expand when the barrels are placed in the superhot Bluing Solution, and will find a weak point in the soldering and "blow-out" a pin hole, or several pin holes, to release the air pressure. Once the air is blown out, hot Bluing Solution is drawn in and out of the cavity by the temperature changes in the Bluing Solution. Some of this Bluing Solution stays trapped in the cavity even after the barrels are rinsed and oiled.

Second, the Bluing Solution now trapped between the barrels reacts chemically with the soft solder and weakens it to the point that it allows the ribs and the barrels to separate. This can happen while the barrels are still in the Bluing Solution, or several days/weeks later. However, if you are determined to do it, we have included the instructions here. Remember the warnings given above and give them heed - if you try to blue enough doubles in Oxynate No. 7 or any boiling caustic solution, you will eventually have problems!

**1)** Remove the front sight. Drill and tap a hole in the top rib where a rear sight will go after the bluing job is completed. (We are drilling the hole for drainage and pressure release, not because a rear sight has anything to do with making the bluing work! Charge the customer for the rear sight when you install it.)

**2)** Immediately under the front sight, in the bottom rib, drill a #31 hole and tap for a 6x48 plug screw. Immediately in front of the water table, close to the take-down lug, drill a second #31 hole and

tap for another 6x48 plug screw. Be sure these two bottom holes are drilled into the void between the ribs and the barrels.

3) Polish and clean the barrels in the usual manner.

4) When you are ready to put the barrels into the Oxynate No. 7 Bluing Solution, it is important that you skim off as much crud and depleted salts and scum as possible. We recommend that you use the Bluing Solution Cleaner if your Bluing Solution is old enough and dirty enough. We do not recommend that you use it on a relatively new Bluing Solution because it will "clean, by darn", whether there is crud to come out or not, and if there is no crud, it will take out good salts.

5) Add Oxynate "S" to the Bluing Solution to ensure proper blackening of the ribs. Follow the instructions for Oxynate "S" **exactly** to avoid damaging your Bluing Solution.

6) Operate the Oxynate No. 7 Bluing Solution at its customary vigorously rolling boil at 292° F.

The barrels must be "slid" rapidly into the bath with both barrels parallel to the top of the Bluing Solution and one end slightly higher than the other for the air in the barrels to escape safely. Use 4 "Z" handles - two on each end - to be sure to have positive control over the barrels. This is important, for putting the barrels in edgewise could easily result in "thermostat" warping of the barrels and/or popping off of the ribs.

7) Leave in Bluing Solution 15 to 20 minutes ONLY.

8) Transfer barrels to Hot Water Rinse Tank by passing the After-Bluing Cold Water Rinse Tank. Stand barrels on one end, then on the other repeatedly, letting the water drain out of the holes you drilled through the ribs into the cavity between the barrels. Continue this step for several minutes in the Hot Water Tank.

9) Transfer the barrels to the After-Bluing Cold Water Rinse Tank and repeat this end-for-end rinsing and draining process for several more minutes.

10) Transfer back to Hot Water Rinse Tank and repeat.

11) Often, cold water under very low pressure is squirted through these holes. (Do Not use high pressure water; a fine stream under high pressure will build up enough hydraulic pressure in the cavity to blow the ribs!)

12) When you are sure the voids between the barrels are clean, and that all Bluing Solution has been rinsed out, return the barrels to the Hot Water Rinse for one last time to get the barrels hot. Remove, shake off water, and blow low pressure air through the holes to ensure thorough drying in the cavity between the barrels.

13) Suspend in Water Displacing Oil Tank overnight; remove and allow to "cure" for a few days before assembling.

14) Remember, you are doing this technique at your own risk - proceed with due caution!

**9) DO NOT USE CYANIDE IN THE BLUING SOLUTION** - Cyanide is a deadly poison. Some of the early instructions for bluing suggested its use. We categorically **DO NOT**. Stay away from the stuff.

**10) NUMBER OF GUNS PER BATCH OF BLUING SOLUTION** - Unfortunately, the answer depends on you, and how you operate your Bluing Solution. In use, 100 pounds of steel run through the solution and colored to a rich blue/black will deplete the solution less than 1%. So, if the Bluing Solution is operated at the correct temperature, well regulated and under controlled supervision, it will blue many, many guns.

There are many factors that can work against the long life of your Bluing Solution, however. The following are the primary ones, and should be reviewed first if your Bluing Solution seems to deplete too rapidly.

1) Occasional use of the Bluing Solutions with long periods of sitting idle until the next use, are actually hard on the useful life of the Bluing Solution. Were you to operate your Bluing Solution on a full time basis, leaving it on all the time as the big commercial operations do, you would get many times longer Bluing Solution life. However, this is not practical, nor cost effective. Therefore, we would recommend "ganging" your bluing jobs as much as possible for maximum cost efficiency and best Bluing Solution life.

2) The water used to mix the Bluing Solution can have a very serious effect on its useful life. Be sure to review the Technical Information on Water Quality. Water contamination could easily be dramatically shortening the life of your Bluing Solution, and is one of the most frequent causes of shortened Bluing Solution life we find when working with customers.

3) The carryover of Cleaning Solution into the Bluing Solution can rapidly shorten the life of the Bluing Solution. The After Cleaning Rinse Tank is very critical. It should be a top overflow

tank so the water in it is kept clean, and the surface of the water kept clean of floating crud.

4) Contamination can kill your Bluing Solution. Did you try to blue aluminum or pot-metal? Have you broken a mercury thermometer in the Bluing Solution? Are your bluing tanks welded (not brazed) black iron? Has a lot of dirt and foreign matter settled into the Bluing Solution while you were storing it between uses because you did not cover it correctly? Has the tank stood a long time without use, even tho' covered, which could lead to carbolic acid neutralization?

5) Temperature control is extremely critical, and can show up in seldom thought of ways. A) Do you break up the chunks well in the bottom of the tank before turning on the heat each time you start up the tank to avoid trapping heat under the crust? B) Do you stir the Bluing Solution often and well during heatup and use to avoid heat pockets? C) Do you add water regularly to replace that lost as steam, and to keep the Bluing Solution temperature from rising above the optimum operating temperature of 292° F.?

As you can see, there are many more things that can cause your Bluing Solution to deplete a lot faster than just bluing.

#### **11) WHEN RE-STARTING TANK, BREAK UP CRUST IN BOTTOM OF TANK**

- After the first time you mix up a Bluing Solution, use it and let it cool down, a hard crust of settled Bluing Salts will form in the bottom of your Bluing Tank, and a thinner crust of hard crystallized Bluing Salts will form across the top. Both of these crusts must be broken up with a rod into small chunks before turning on the heat source under your Bluing Tank. If the crusts are not broken up, two things happen. First, steam forms between the bottom of the Bluing Tank and the bottom crust, and when the pressure gets high enough, it erupts, spewing hot Bluing Solution and superheated steam out of the Bluing Tank and over the bluing room. Second, because the heat is trapped, the Bluing Solution will get very much hotter at the interface between the crusts and the bottom of the Bluing Tank than the correct operating temperature of 292° F., and may cause a heat kill of the semi-liquid Bluing Solution below the crusts, and the Bluing Salts in the crusts.

**12) STIR, AGITATE, AND STIR AGAIN** - Stir the Bluing Solution thoroughly, and verify that the Bluing Solution is boiling vigorously at 292° F. When you are starting up the Bluing Tank for each bluing session, we strongly recommend that you run a "test piece" completely through your bluing operation to be sure that everything - from 909 Cleaning Solution Tank to Oxynate No. 7 Bluing Solution Tank - is operating correctly. When you are satisfied that all is well, and immediately before transferring the guns to the Bluing Tank, stir the Bluing Solution thoroughly again, and verify once again that the Bluing Solution is boiling vigorously at 292° F. When placing the Small Parts Basket into the Bluing Solution Tank, dip the Small Parts Basket into the Bluing Solution, jiggling it up and down several times to ensure full coverage of the parts, and suspend the basket from the lip of the Bluing Tank. Barrels should be slid into the Bluing Solution lengthwise using "Z" hooks described below, and when they are covered by the Bluing Solution, they should be tipped within the Bluing Solution from time to time, as well as moved often on the holding racks. As soon as all parts are in the Bluing Solution, stir the Bluing Solution often with long movements, being sure to keep the Bluing Solution thoroughly stirred throughout the whole Bluing Tank. Move the Small Parts Basket every few minutes to ensure full contact of all parts in it with Bluing Solution. Barrels and actions suspended on hangers should be moved frequently, too, for the same reason.

Keep an eye on the thermometer and the operating temperature. Be sure to stir, check the temperature, and add water as needed every few minutes to maintain a vigorous rolling boil at 292° F.

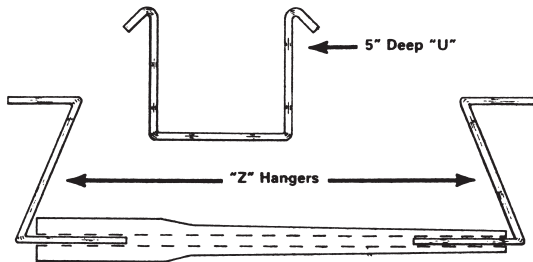
**13) SUSPEND PARTS IN TANK** - Parts should be suspended in the Bluing Solution because contact with the edges or bottom/sides of the tank will cause excessive heat conduction into the part at that point. Now, being too hot at the point of contact to turn blue in the Bluing Solution, the part or contact point turns red (the color metal turns in the Oxynate No. 7 Bluing solution when either the metal or the Bluing Solution is too hot). This is the reason barrels or actions laid directly on the bottom of the tank get an unexplained "red streak" on the contact side. Definitely undesirable and to be avoided.

There are undoubtedly a number of acceptable ways to suspend guns and their parts in the Bluing Solution. The point of any method is to keep the parts from touching the Bluing Tank in any way. For these instructions, we'll discuss 2 common methods. You may well end up using a combination of these, as we do.

**METHOD 1) Basket, Racks and "Z" Hooks** - For handguns, receivers and the like, use Parts Baskets which you suspend

from the sides of the tank or hold above the bottom of the tank by putting large bolt and washer lugs in each corner of the Basket. Install a black-iron, screen-wire liner in a Parts Basket to contain the many pins, screws and small parts to be blued.

For barrels and barreled actions, make 2, big, flat-bottomed "U"s out of mild welding rod, being sure to remove any plating or covering on the rod. Leave the legs of the "U" long, and bend hooks in the ends of the legs to hook over the sides of the tank, suspending the flat-bottomed part of the "U" an inch from the bottom of the Bluing Tank. These "U"s should be removable, and kept out of the Bluing Tank and out of the way when they are not needed. When hung in the Bluing Tank, be sure they are close enough together to support the barrels.



To handle barrels and actions in the different tanks, make yourself some "Z"-shaped hangers out of small diameter, mild welding rod, being sure to remove any plating or covering on the rod. The bottom leg of the "Z" slips into the barrel, and the top leg makes a convenient handle. The top and bottom limb should be about 3" to 4" long; the center leg at least 7" to 8" long.

**METHOD 2) Black Iron Wire Hangers** - All parts that are large enough to be individually hung from black iron wire can be suspended in the Bluing Solution on hanging loops. Because the wire is soft and easily formed, it is quite easy to use, and to make into just about any hanging rig wanted.

With the "Continuous Loop" method, a loop of black iron wire is threaded through an opening in the part and the two ends are twisted together. The Loop is used to move the part around; agitate it up and down; place it on the racks, into the baskets and so on.

With the "T-handle" method, a length of wire is threaded through the part, for instance a barrel, and each end is wrapped around a separate wood dowel, piece of welding rod, scrap barrel or the like, that is at least 3"-4" longer than the width of the tank. Each end of the black iron wire is wrapped tightly enough around the handles to keep it from slipping, and the length of the wire is adjusted during the wrapping to permit the part to hang at the correct depth in the Bluing Tank with the "T-handles" lying across the top of the tank, suspending the part. Then, using both hands, one on each "T-handle", the parts are readily maneuvered around in the tanks and between the tanks.

**14) INSPECTING PARTS DURING BLUING** - Because the Bluing Solution operates at such a high temperature, and the metal gun parts get so hot in it, the Bluing Solution will evaporate almost instantly on the hot metal surface when parts are taken out of the Bluing Solution for inspection, forming very hard and tenacious "scum" and "water spots". These can only be removed by rubbing out with steel wool after bluing is completed, or, in severe cases, by repolishing and rebluing. To avoid this problem, pull the parts very quickly from the Bluing Solution, plunging them right into the top-overflow After-Bluing Cold Water Rinse Tank until they cool down enough that the water does not evaporate on the surface of the metal.

Be very careful when putting barrels, magazine tubes and so on into the After-Bluing Cold Water Rinse Tank to be sure that you slide them into the tank with an open end of the barrel or tube up and pointed away from the operator. Because of the extreme heat of the metal, steam will frequently form inside the barrel or tube which can "blowout" the open end onto the operator. When the parts have cooled down, you can then inspect and examine all you like without damage to the part. If you feel more bluing time is necessary, you can put the parts you have inspected back into the Bluing Solution with no problem, **PROVIDED you have:** 1) used a top-overflowing, After-Bluing Cold Water Rinse Tank so the crud and Bluing Solution you have washed off parts have been rinsed out of the tank or, 2) you

are using a separate, After-Bluing Cold Water Rinse Tank that only has parts from the Bluing Tank put into it. If you are using only one Cold Water Rinse Tank after both Cleaning and Bluing, you may well contaminate the freshly blued parts with crud still in the water from the cleaning cycle. It's rare, but we've had reports of it, and you should be cautious, and replace the water in the Cold Water Rinse Tank with fresh water after you have finished rinsing following Cleaning, and before rinsing following Bluing.

**15) REMOVING PARTS FROM THE BLUING SOLUTION** - After the parts have remained in the Bluing Solution for approximately 20-30 minutes, and the color is satisfactory following inspection, they should be immediately, carefully, plunged into the After-Bluing Cold Water Rinse Tank.

**DO NOT:** delay transferring parts from the Bluing Tank to the After-Bluing Cold Water Rinse Tank. Do Not stop to examine parts during the transfer. If the hot Bluing Solution dries on the surface of the blued steel it forms the same hard and tenacious "scum" and "water spots" discussed in #13) above. Once in the After-Bluing Cold Water Rinse Tank, agitate and swish the parts around thoroughly to remove all traces of Bluing Solution, taking particular care to completely clean the recessed areas. Do not touch the bluing or handle it roughly, for it is still quite tender until it has time to cure.

After the parts are cooled down in the After-Bluing Cold Water Rinse Tank, they can be safely taken out and closely examined for quality of the bluing. Do not touch the new bluing. During examination, if you keep the metal wet it makes the bluing job look as it will after final oiling, and the bad spots show up easier. When you are using a top-overflow After-Bluing Cold Water Rinse Tank, so the crud and Bluing Solution you rinsed off have been washed out of the tank, parts can be safely transferred back into the Bluing Solution for additional time, if desired, without contaminating the surface of the metal and possibly causing spots to show up later.

**16) DO NOT USE MODERN/MIRACLE RUST PREVENTIVE OILS BEFORE OR IMMEDIATELY AFTER BLUING** - Gun oils containing silicone and the new "wonder" rust-preventive, moisture-removing, dirt-removing gun oils do a great job of keeping guns in beautiful condition. However, because these "exotic" oils are specifically designed to prevent any foreign material from contacting or changing the surface of the metal they are on, they "see" Bluing Solution as a surface contaminant/rust and prevent it from coloring the steel. They should not be used on a gun that has just been polished and is waiting to be blued. At the very least, these oils cause streaking/discoloration in the bluing. At the worst, the metal just will not blue, and will have to be extensively repolished.

Before repolishing, however, try removing the "exotic" oils and silicones in a soaking bath of TCE Cleaner Degreaser or similar chlorinated-hydrocarbon solvent. Experience has shown they are often not completely removed by Dicro-Clean 909 Cleaning Solution or any other typical bluing system cleaner.

If these "exotic" oils are applied to freshly-blued guns, they will usually streak and lighten the new blue, particularly if you try to wipe off the excess oil. WD-40 is often reported to us by customers as being the most often used "exotic" oil that causes problems. However, none of them are safe until at least 4 days after the bluing job has cured; even then, we don't use them ourselves. Brownells Water Displacing Oil is one of the finest rust inhibitors and surface protectors available on the market; why take chances with a newly-blued gun?

**17) COLOR BLENDING** - To get the best possible color in the newly oiled bluing, rub all the guns down the next day after they are oiled, with a cheap, brown, paper towel - the kind used in school lavatories that can take the skin off your hands if you rub hard enough. "Polish" the guns as tho' you were polishing the family silver. If the color of the bluing looks a little uneven, warm the gun over a clean heat source (like the pipe burner) until it is almost too hot to handle without gloves. Coat it liberally with a pure, lightweight, mineral oil (from the drugstore or use Pro-Tek Oil). Then set the gun aside overnight. The next morning, rub it down with the rough, brown, paper towels, using the same "polishing the family silver" technique.

This really blends the streaks caused by variations in the metal and gives the bluing job a "mile-deep" look. By the way, this procedure won't work if you use good quality or soft, paper towels; it has to be done with the coarse, brown ones.

# OXYNATE NO. 7

## STEP-BY-STEP BLUING PROCEDURE



**SUSPEND PARTS IN FRESH 909 CLEANING SOLUTION** to remove all dirt, grease oil and crud. "Cleanliness is Next to Godliness" - Always! Operating Temperature: 180° F. Immersion Time: 10-15 minutes.



**RINSE CLEANED PARTS** in flowing Cold Water Rinse Tank. Scrub parts thoroughly with soft brush to remove all traces of Dicro-Clean 909 Cleaning Solution. Work rapidly. Immersion Time: Not to exceed 2 to 3 minutes.



**SUSPEND RINSED PARTS IN THE OXYNATE NO. 7 BLUING SOLUTION.** Optimum Operating Temperature: Vigorous rolling boil at 292° F. Typical Time in Bluing Solution: 20-30 minutes.



**RINSE BLUED PARTS** in After-Bluing Cold Water Rinse Tank. Agitate and swish parts around thoroughly to remove all traces of Bluing Solution. When parts have cooled to room temperature in the cold water, carefully examine for blemishes, discolorations, flaws in bluing.



5

or

5A

**SUSPEND RINSED PARTS IN HOT WATER TANK** to remove all final traces of Bluing Solution/Salts. Operating Temperature: Vigorous boil. Immersion Time: 5-10 minutes for simple parts; 15-30 minutes for complex parts. (Some water sources damage/lighten/remove new bluing with long immersion. Watch carefully. Review Technical Info in Water Quality, page 6.)

**SUSPEND RINSED PARTS IN B.O.N. TANK** instead of Hot Water Rinse Tank. Mixing: 6 oz. (by weight) to 1 gallon water. Operating Temperature: 130° to 140° F. Immersion Time: With intermittent agitation, 30-45 minutes. Transfer to Hot Water Tank and complete Step 5.



6

or

6A

**SUSPEND HOT RINSED PARTS IN WATER DISPLACING OIL.** Transfer the parts quickly to Water Displacing Oil Tank and plunge into tank, agitating vigorously for a minute or so. Allow parts to cool immersed in the Water Displacing Oil. Use full strength. Operating Temperature: Room Temperature; recommended 68° F. min. to 90° F. max. Do Not Heat Oil. Immersion Time: Until cool; typically 45-60 minutes, to allow maximum displacement of entrapped water.

**SUSPEND RINSED PARTS IN PRO-SHEEN TANK** instead of Water Displacing Oil Tank to give gloss wax, final finish. Not a water displacing product, so parts must be thoroughly dry inside and out to prevent water entrapment under the Pro-Sheen. Mixing: 1 part Pro-Sheen with 9 parts Pure Water. Operating Temperature: 68° F. min. to 90° F. max. Immersion Time: Until parts are cool; typically 30-45 minutes.



7

or

7A

**"CURE" AND REASSEMBLE GUN.** Remove from Water Displacing Oil Tank, and hang on rack over tank to allow excess Oil to drain back into tank. Because new blue is very tender, minimum handling recommended for 24 hours to allow blue to "cure". When cured, wipe excess oil off parts with soft cloth and reassemble gun.

**COAT PRO-SHEEN'D PART GENEROUSLY WITH PRO-TEK** for added protection over the Pro-Sheen. Use full strength. Operating Temperature: 68° min. to 90° F. max.



## BLUING OPERATION STEPS

We are now ready to actually begin bluing guns. Follow these steps in the order given to minimize potential problems. If you decide to deviate from this routine, please don't expect us to be able to solve the problems your deviation creates. The Oxynate No. 7 Bluing Solution works as outlined below; please use this procedure so we can help you if things do go astray for you.

### STARTING UPTANKS AND SOLUTIONS

**(1) PREPARE THE SURFACE OF THE METAL** to be blued by polishing to the desired grit level, sand blasting, bead blasting, wire wheel brushing, etc. Bluing will hide nothing.

Clean off excessive crud, oils and grease from guns with d-Solve™ or TCE, to get reasonably clean before putting into 909 Cleaning Solution Tank. Run patched cleaning rod through bore and magazine tubes to clean out excessive crud. Check for obstructions. All parts should be completely prepared before going to the next step.

#### **(2) START BLUING SOLUTION TANK -**

**NEW SOLUTION** - See page 7, "To Mix One Gallon Of Oxynate No. 7 Bluing Solution." Follow steps exactly. Mixing Ratio: 10 pounds of Oxynate No. 7 to 1 gallon of water.

#### **EXISTING BLUING SOLUTION -**

**a)** Break up the solid crusts on the top of the Bluing Solution, and in the bottom of the Bluing Tank.

**b)** Turn on Bluing Tank heat source.

**c)** Stir Bluing Solution frequently while allowing to rise to operating temperature of vigorous rolling boil at 292° F. Time required: 45 minutes, typically.

**(3) START 909 CLEANING SOLUTION TANK** 10-15 minutes before the Bluing Solution reaches operating temperature:

**a)** Mix a fresh batch of Dicro-Clean 909 Cleaning Solution at the rate of 5 ounces (by weight of Dicro-Clean) to 1 gallon of water. See page 6, "To Mix One Gallon Of Hot Dicro-Cleaning Solution." Do Not keep 909 Cleaning Solution from bluing day to bluing day. Start with a fresh batch each time you make a bluing run.

**b)** Stir Cleaning Solution frequently during heat-up and dissolve sequence. Time required: 10-15 minutes.

**c)** Stabilize operating temperature at 180° F. Do Not Boil Dicro-Clean 909 Cleaning Solution.

**(4) FILL COLD WATER RINSE TANK, AFTER-BLUING COLD WATER RINSE TANK, AND HOT WATER RINSE TANK** with fresh, clean water. Review "Technical Information on Water Quality," page 6, for proper water source.

**a)** Start top-overflow system on Cold Water Rinse Tank just after parts are put in 909 Cleaning Tank.

**b)** Turn on heat source under Hot Water Rinse Tank just after parts have been put into Bluing Solution. Heat-up time required for full tank to boil; 20-30 minutes, typically.

**WARNING: Wear face shield, rubber apron and rubber gloves when mixing and/or using any of the chemicals mentioned in these instructions. Use these products ONLY in a well ventilated area. Keep all products Out of Reach of Children.**

### STEP-BY-STEP BLUING OPERATION

**1** **SUSPEND PARTS IN FRESH 909 CLEANING SOLUTION** to remove all dirt, grease, oil and crud. "Cleanliness is Next to Godliness" - Always! **Operating Temperature: 180° F. Immersion Time: 10-15 minutes.**

**2** **RINSE CLEANED PARTS** in flowing Cold Water Rinse Tank. Scrub parts thoroughly with soft brush to remove all traces of Dicro-Clean 909 Cleaning Solution. Work rapidly. **Immersion Time: not to exceed 2 to 3 minutes.**

**3** **SUSPEND RINSED PARTS IN THE OXYNATE NO. 7 BLUING SOLUTION.** Optimum **Operating Temperature: Vigorous rolling boil at 292° F. Typical Time in Bluing Solution: 20-30 minutes.**

**4** **RINSE BLUED PARTS** in After-Bluing Cold Water Rinse Tank. Agitate and swish parts around thoroughly to remove all traces of Bluing Solution. When parts have cooled to room

temperature in the cold water, carefully examine for blemishes, discolorations or any flaws in bluing.

**5** **SUSPEND RINSED PARTS IN HOT WATER TANK** to remove all final traces of Bluing Solution/Salts. **Operating Temperature: Vigorous boil. Immersion Time: 5-10 minutes for simple parts; 15-30 minutes for complex parts.** (Some water sources damage/lighten/remove new bluing with long immersion. Watch carefully. Review Technical Info on Water Quality, page 6.)

**6** **SUSPEND HOT RINSED PARTS IN WATER DISPLACING OIL.** Transfer the parts quickly to Water Displacing Oil Tank and plunge into tank, agitating vigorously for a minute or so. Allow parts to cool immersed in the Water Displacing Oil. **Use full strength. Operating Temperature: Room temperature; recommended 68° F. minimum to 90° F. maximum. Do Not Heat Oil. Immersion Time: Until parts are cool; typically 45-60 minutes** to allow maximum displacement of entrapped water.

**7** **"CURE" AND REASSEMBLE GUN.** Remove from Water Displacing Oil Tank, and hang on rack over tank to allow excess oil to drain back into tank. Because new blue is very tender, **minimum handling recommended for 24 hours** to allow blue to "cure." When cured, wipe excess oil off parts with soft cloth and reassemble gun.

### ALTERNATE STEPS

**5A** **SUSPEND RINSED PARTS IN B.O.N. TANK** instead of hot Water Rinse Tank. **Mixing: 6 oz. (by weight) to 1 gallon water. Operating Temperature: 130° to 140° F. Immersion Time: With intermittent agitation, for 30-45 minutes.** Transfer to Hot Water Tank and complete Step 5.

**6A** **SUSPEND RINSED PARTS IN PRO-SHEEN TANK** instead of Water Displacing Oil Tank to give gloss wax final finish. Not a water displacing product, so parts must be thoroughly dry inside and out to prevent water entrapment under the Pro-Sheen. **Mixing: 1 part Pro-Sheen with 9 parts Pure Water. Operating Temperature: 68° F. minimum to 90° F. maximum. Immersion Time: Until parts are cool; typically 30-45 minutes.**

**7A** **COAT PRO-SHEEN'D PARTS GENEROUSLY WITH PRO-TEK** for added protection over the Pro-Sheen. **Use full strength. Operating Temperature: 68° F. minimum to 90° F. maximum.**

That's all there is to it. But, things can happen, and because problems in a bluing operation can be very frustrating, we have developed a unique "Trouble Shooting" Section which walks you through the problems you might experience and gives the most likely cure for each. Please refer to it often.

### IN CASE OF TROUBLE

If a gun does not come out of the Bluing Solution looking like you think it should, do not immediately assume it is your fault, or the fault of the chemicals, or the process. Take a good look at the metal of the gun itself.

Cast iron will get red-yellow or plum-purple tones.

Late Model 94 Winchester receivers above serial #2,700,000 are cast metal and will not blue in Oxynate No. 7.

Stainless Steel will not blue in Oxynate No. 7.

Chrome-plated or nickel-plated parts will not blue in Oxynate No. 7.

Aluminum, pot-metal, brass and their alloys will not blue, but will dissolve/disappear in the Bluing Solution, ruining it at the same time.

Hardened and heat-treated steels usually turn purplish.

Case-hardened steel or iron will come out of the Bluing Solution with a tough, green or yellow scum.

Many investment cast frames and investment cast parts will come out with a red or purplish color, while others may blue fine, and still others won't blue at all.

If a gun has over 1-2% silicone in the steel, it will come out a bright red, or with bright red blotches. Many Ruger guns - particularly the earlier ones - are classic examples of this particular problem because of the silicone used in the investment cast method by which they are made.

So - first examine what you are trying to blue. If the metal checks out okay, then check both your technique and procedure, beginning with the Four-Step Cross-Check Test outlined below.

## FOUR-STEP CROSS-CHECK TEST

In bluing there are basically two areas that can cause you trouble. 1) Metal Cleaning; and 2) Bluing Procedures and Solutions. The metal cleaning problems are covered in the Technical Information On Mixing & Using Dicro-Clean 909 Cleaning Solution section, page 6; please review it. If you are having problems, it is imperative that you understand the importance of proper metal preparation.

The Bluing Procedures and Solutions are covered below, and the Four-Step Cross-Check Tests should be conducted carefully to know where your problem lies.

**STEP 1: CHECK THE THERMOMETER** - First, look your thermometer over very carefully, particularly checking for Bluing Salts residue inside the glass, or a needle that seems to be stuck, or a face with the paint and numbers eaten off. These are all indications that the thermometer has leaked, and it should be returned to the supplier for replacement.

If it appears okay, next, check your thermometer to see if the needle is sticking by putting the thermometer quill in a tall can of 5" deep, violently boiling water. The needle should rise rapidly and smoothly to around 200° to 210° F. This test is to be sure that the thermometer needle is not sticking; Do Not be concerned whether or not the needle registers 212° F. which is the boiling temperature of pure water at sea level. Boiling temperature variations can be caused by altitude above sea level, and the purity and violence of the boiling water. If the thermometer does not function correctly, contact the supplier for a replacement.

To test the thermometer at higher temperatures and to be sure that it is not sticking before it reaches 292° F., use your wife's deep fat fryer filled with oil, and set its thermostat at about 320° F. Immerse your bluing thermometer in the hot oil along with a good quality candy or oven thermometer that reads up to 400° F. As the two thermometers come up, they should run very close together. If they do not, contact us if you bought the Bluing Thermometer from us (ours are calibrated at 300° F. with a ± 1%, and we will check it for you and replace it at no charge, if faulty.

### PREPARE TEST PIECES

Take a few pieces of scrap gun barrel that are known to blue correctly, and polish thoroughly with clean, dry, 240 grit emery cloth, enough to knock the old bluing off, and clean up the metal so you can watch the colors carefully. Do Not use crocus cloth or rouge. Do not use any lubricating agent like oil, kerosene or water. Do not use your usual technique because, as mentioned above, it may be your polishing procedure that is causing you the problem. Be sure the Cleaning Solutions and Bluing Solutions are working correctly on a known piece of steel polished in a controlled manner before tackling the problems caused by improper metal preparation. These Test Pieces will be used for the next 3 Cross-Check steps. With your Bluing Solution stabilized and boiling vigorously at 292° F., do Cross-Check Steps 2, 3 and 4.

**STEP 2: CHECK THE PRE-BLUIING PROCEDURE** - Take one of the

Test Pieces you prepared above, and do not clean or rinse it after polishing. Suspend the Test Piece in the operating Bluing Solution.

a) If the Test Piece does not blue, the problem is with your Bluing Solution, and it will have to be replaced.

b) If the Test Piece does blue correctly, the problem lies in something that is being done prior to the Bluing Tank in either the way you are protecting the metal after polishing, or in the 909 Cleaning Solution Tank, or the Cold Water Rinse Tank.

**STEP 3: CHECK THE COLD WATER RINSE TANK** - Take a different one of the Test Pieces that you prepared, and do not clean it in the 909 Cleaning Solution, but go directly into the Cold Water Rinse Tank. Be sure to use the water source you regularly use, the scrub brush you regularly use, and leave it immersed in the water for as long a time as you do the guns when you are bluing. Do not vary any steps or procedures you regularly follow with the Cold Water Rinse Tank. Transfer the Test Piece to the Oxynate No. 7 Bluing Solution which you proved in Step 2 was working correctly.

a) If the Test Piece does not blue, the problem is with your Cold Water Rinse Tank, and it will have to be dumped and a different water source found. Or, you will have to modify your procedure by shortening the length of time you leave the Test Piece in the Cold Water Rinse Tank, because if you leave the clean part in the tank very long, it will start to rust as a result of being chemically clean and coming in extended contact with the free oxygen in the water.

b) If the Test Piece does blue correctly, the Cold Water Rinse Tank and your Rinsing procedure are okay, and you can continue to use your present water source and procedure.

**STEP 4: CHECK THE 909 CLEANING SOLUTION** - Take another one of the Test Pieces that you prepared, clean it in the 909 Cleaning Solution, and put it through the Cold Water Rinse Tank. Be sure to use the exact same 909 Cleaning solution that you used when you ran into problems (do not mix up a fresh one), and leave it immersed in the 909 Cleaning solution for as long a time as you do the guns when you are bluing. Do not vary any steps or procedures you regularly follow with the 909 Cleaning Solution Tank. Following the Cold Water Rinse, transfer the Test Piece to the Oxynate No. 7 Bluing Solution which you proved in Step 2 was working correctly.

a) If the Test Piece does not blue, the problem is with the 909 Cleaning Solution Tank, and it will have to be dumped and a new solution mixed. The problem may be a water source problem, and a different water source may have to be found. The problem may be that you did not mix a fresh batch of 909 Cleaning Solution when you started the bluing operation. Please review the "Starting Up Tanks and Solutions" section for procedure in setting up a fresh tank.

b) If the Test Piece does blue correctly, the problem is with the metal content of the gun you are trying to blue that led you to believe you had a problem. Please review the "Problem List" at the beginning of this section for help in identifying your specific metal problem.

With the above Cross-Check Test, you have established where the problem is in your bluing operation by cross-checking one solution at a time against the other solutions, eliminating each potential problem area as you go until you find the solution that is at fault.

## TROUBLE-SHOOTING CHART

MALFUNCTION		MALFUNCTION	
Probable Cause	Remedy	Probable Cause	Remedy
<b>OVER-ALL GRAY CAST</b>			
1. Too low an operating temperature.	Check thermometer for correct reading. Be sure Bluing Solution is boiling vigorously at 290°-295° F.	4. Presence of oil in rinse water.	Double check water supply - examine surface of water for presence of oil slick.
2. Bluing Solution approaching depletion.	Replace with fresh Bluing Solution.	<b>GRAY STREAKS</b>	
3. High nickel steel content.	Hold Bluing Solution at normal operating temperature for 15 minutes then allow temperature to increase up to 310° F., and leave part in Bluing Solution for 15 minutes after it has taken on proper color.	1. Presence of oil or dirt on surface of metal.	Check cleaning operation, water supply for presence of oil or excessive dirt. Examine parts immediately prior to immersion in Bluing Solution for signs of puddling around ramps, holes, joints.
		2. Use of modern/miracle rust preventives.	

TROUBLE-SHOOTING Cont. next page.

# TROUBLE-SHOOTING CHART

## MALFUNCTION

### Probable Cause

### Remedy

#### GRAY STREAKS (Cont.)

- |   |  |
|---|--|
| 3. Getting metal too hot when using 555 or other grease-type polishes, actually laps polish into surface. | Do not let metal get too hot when polishing. Cure is to repolish starting with coarse grits. |
| 4. Polishing with rouge.  | Do not use rouge - contains Ferric Oxide (rust!) and will lap into metals.                   |

#### OVERALL RED CAST

- |   |   |
|---|---|
| 1. Too high an operating temperature.   | Check thermometer for correct reading - be sure Bluing Solution is not boiling too actively.  |
| 2. Attempting to blue high carbon steel at too high an operating temperature. | Very high carbon steel will blue best if initial immersion temperature is approximately 285° F. Allow temperature to increase to approximately 295° F. before removing. |
| 3. Allowing parts to come into contact with sides or bottom of tank.          | Suspend parts correctly in Bluing Solution.   |

#### RED STREAKS

- |  |   |
|--|---|
| 1. Allowing parts to come in contact with sides or bottom of tank or other large parts in Bluing solution. | Suspend parts correctly in Bluing Solution.   |
| 2. Presence of spot hardening in metal.  | Scrub parts in clean water and return to Bluing Solution until correct color is achieved. A slight temperature increase AFTER parts have started to color will speed up the action. |
| 3. Not stirring Bluing solution regularly.   | Stir Bluing Solution often, including while parts are in tank.  |

#### MOTTLED RED COLORS

- |   |   |
|---|---|
| 1. Attempting to color Cast Iron without taking proper precautions. | Use Oxynate "S". In a few instances a 10 minute immersion in Rust Remover just prior to bluing will give relief. Sandblasting of surface will also help at times. |
| 2. Not having parts properly suspended.                             | Separate parts. Be sure they are 1" or more from sides/bottom of tank.  |

#### RED/PURPLE COLOR

- |  |   |
|--|---|
| 1. Generally occurs on Mauser bolt stop springs and extractor springs. | Suspend parts in cold Bluing Solution and allow to remain in Bluing Solution until day's work is completed. Will generally take correct color. If not, bring to mirror polish and do not blue. Gives nice effect to gun. Use Oxynate "S". |
|--|---|

#### YELLOW/RED COLOR OR SCUM ON SURFACE

- |  |   |
|--|---|
| 1. Attempting to blue case-hardened parts without sufficient pre-polishing and cleaning. | Polish part thoroughly prior to bluing. Short immersion in Rust Remover will generally overcome this trouble. |
| 2. Presence of foreign matter or oil in water or on gun's surface.                       | Check water supply and cleaning procedure.  |

## MALFUNCTION

### Probable Cause

### Remedy

#### UNBLUED SPLOTCHES

- |   |   |
|---|---|
| 1. Presence of caked polishing compound on metal's surface. | Scrub parts thoroughly with brush after cleaning but prior to immersion in Bluing Solution. |
|---|---|

#### SILVER SPECKS IN FINISHED JOB

- |   |   |
|---|---|
| 1. Overexposure to cleaning solution.   | Either decrease strength of cleaner or shorten exposure of part to the cleaning solution.   |
| 2. Leaving parts in rinse after cleaning prior to bluing for too long a time. | Free oxygen in rinse water will attack the chemically clean steel and cause oxidization after a very short period of time, resulting in a multitude of specks in the finished job. The use of lye as the cleaner is the most common offender. |
| 3. Using too caustic a cleaner or using lye as a cleaner.                     | Use Dicro-Clean 909.  |
| 4. Aluminum parts left on gun have dissolved in bath.                         | Completely disassemble gun and remove ALL aluminum parts before bluing. Bluing Solution may need to be replaced.  |
| 5. Tiny rust pits have filled with polish that does not come out in cleaning. | Run parts through Rust Remover before polishing, polish to bottom of pits or sandblast these parts.   |

#### FAILURE OF SOLUTION TO BOIL AT 292° F.

- |                                |  |
|--------------------------------|--|
| 1. Faulty Thermometer.         | See "Cross Check" above for testing procedure.   |
| 2. Bluing Solution too strong. | Cautiously add water to the Bluing Solution, stirring after each addition until sufficient water has been added that Bluing Solution will boil vigorously at 292° F. |

#### SOLUTION BOILS AT TOO LOW A TEMPERATURE

- |                                      |   |
|--------------------------------------|---|
| 1. Faulty Thermometer.               | See "Cross Check" above for testing procedure.  |
| 2. Bluing Solution too weak.         | Either add a small amount of Bluing Salts at a time until strength of Bluing Solution has been properly increased to correct density, or let Bluing Solution boil until sufficient water evaporates out as steam and the Bluing Solution is brought to a vigorous boil at 292° F. |
| 3. Long storage during damp weather. | Modern bluing salts are very hygroscopic in nature. They will take on a great deal of moisture from the air and thus increase balance of water to salts.  |

#### SCUM ON THE BATH

- |                               |  |
|-------------------------------|--|
| 1. Natural Chemical Reaction. | Do not remove from Bluing Solution unless it has turned brick red - then just remove red portions. If entire Bluing Bath is red, it is depleted and should be renewed. |
|-------------------------------|--|

Actual shop and laboratory experience has shown that nearly 99% of bluing failures are due to one of three causes:

1) **Improper Temperature Control:** including failure to add water to the Bluing Solution on a regular basis to control temperature rise; failure to stir regularly and thoroughly to make the Bluing Solution an even, constant temperature throughout; and failure to make the Bluing Solution deep enough to allow the thermometer to correctly read the actual Bluing Solution temperature.

2) **Contaminating The Bluing Solution:** including using water that brings Bluing Solution-killing chemicals into the Bluing Tank; putting metals into the bath that dissolve and contaminate or destroy the Bluing Solution; and storing the Bluing Solution uncovered, or for

periods of time between uses, which permits carboric acid to form that weakens or kills the Bluing Solution.

3) **Incorrect Cleaning Methods:** including not starting each bluing day with a fresh batch of 909 Cleaning solution; using other cleaning solutions like gasoline, acetone, MEK, Tri-Sodium Phosphate, lye and other strong alkalies that either don't clean thoroughly, leave a residue, or damage the metal; or, once having coated the polished metal parts with one of the "exotic" gun oils, not removing it completely.

The remaining 1% of the failures generally fall to faulty or damaged equipment, including a damaged thermometer, not hot enough heat source, failure to understand and follow these instructions, and, finally, all the gremlins that led to the discovery of Murphy's Law.

## ELECTRIC TANK HEATING SYSTEM INSTRUCTIONS

Brownells Electric Tank Heaters have a great many benefits: they are easy to control, heat incredibly evenly and are very efficient; all the heat output goes directly into the solution being heated. And, an electric system makes it possible to Blue and Parkerize firearms where natural gas or propane are not available, or where local restrictions make a gas-fired system impractical.

The instructions which follow will help you select, install and start-up an electric system. The Bluing and Parkerizing operation steps themselves are the same as with a gas-fired system. Those steps, and much more, are covered in our Bluing and Parkerizing Instruction Booklets. If a copy was not included with these instructions, please call and we will send you a set, no charge.

The Electric Tank (E/T) Heaters come with a bare "pigtail". You will need to have an electrician wire each E/T Heater to its own Control Unit, and the Control Unit to your 220/240 volt, single-phase electrical distribution system. Each E/T Heater can draw as much as 25 amps under full load and should be wired to its own 30 amp circuit.

Two "ranges" of E/T Heaters are available. The **Low Range 4KW** unit is capable of heating Dicroclean 909 Cleaning Solutions, BON, and Parkerizing Solutions not exceeding the capacity of our 6" x 9" x 40" Black Iron Deep Tank, plus Hot Water Rinse Tanks and Oxynate No. 7 and No. 84 Bluing Solution Tanks of capacity not exceeding our 6" x 6" x 40" Black Iron Tank. The **High Range 6KW** unit is specifically made to heat Oxynate No. 7 and No. 84 Solutions in our 6" x 9" x 40" Black Iron Deep Tank, and to heat the Hot Water Rinse in either the Black Iron Deep Tank or our new Fiberglass Deep Tank. The 4KW heater does not have the capacity to bring Oxynate No. 7 or No. 84 to their correct operating temperature and maintain a rolling boil in the Deep Iron Tank, because the resulting boil is too vigorous to be contained in the available depth of the tank.

### OXYNATE NO. 7 BLUES GUNS

The Control Units are available in two heat ranges: **Low Range, 30° to 220° F**, and **High Range 200° - 500° F**, and must be selected to match the application. They contain a non-indicating variable heat control with 30 amp A.C. magnetic contactor with 240 volt holding coil. The Low Range unit must be used for the Dicroclean 909 Cleaning Solution Tank, Hot Water Rinse Tank, Parkerizing Solution Tank, and BON Tank. The High Range unit is necessary only for heating Oxynate No. 7 and No. 84 Solutions in the Black Iron Deep Tank.

The following application list is for the Black Iron Deep Tanks:

USE	OPERATING TEMP	HEATING UNIT		CONTROL UNIT	
		4kw	6kw	LOW, 30-220° F	HIGH, 220-500° F
909 Cleaner Boiling	180° F.	X		X	
Water Rinse	212° F.		X	X	
Parkerizing	190° F.	X		X	
Oxynate #7	292° F.		X		X
Oxynate #84	245° F.		X		X
B.O.N.	130° F.	X		X	

The E/T Heaters are very easy and straightforward to use, however, there are some basic. . .

### RULES THAT MUST BE OBSERVED & SETUP "HELPS"

1. Make sure the E/T Heater's heating element and its over-temperature sensor are completely submerged (minimum depth of 2" to 3") in the solution or bath.

2. Make sure the thermocouple probe lies freely at, or near the bottom, of the tank. It should not be trapped under the heating element, or between the element and the sides of the tank. Do not attempt to remove its protective plastic covering. The covering is made of a sophisticated synthetic material that is resistant to the heat ranges and chemicals necessary to blue and parkerize. Removing the covering will destroy the integrity of the unit. The wire can be gently bent to accommodate differing positions of the tank and Control Unit, but DO NOT kink or bend it sharply. The large diameter portion at the extreme end of the probe must not be bent.

3) DO NOT attempt to bend the heating element to accommodate a tank of different dimensions.

4) DO NOT wire the E/T Heater directly to your power source. The E/T Heaters must first be wired to the Control Unit, and the Control Unit wired to your electrical power source.

5) Because the heating element lies on the bottom of the tank, breaking-up the solidified salts is neither required nor recommended, due to potential damage to the heating elements. When the salts have begun to liquify, you can gently agitate the solution with a "paddle" to speed heatup. Adjust the Control Units for all tasks, except the Oxynate No. 7 or No. 84 Tank and Hot Water Rinse Tank, as you would any thermo-statically-controlled device. The Oxynate No. 7 or No. 84 Tank and Hot Water Rinse Tank will be discussed in Step 6, below. To operate the E/T Heater, set the temperature you wish to maintain using the dial on the front of the Control Unit. This will produce an operating temperature "close" to the dial setting. You must measure the temperature of your solution with an accurate thermometer in the solution. We recommend our Bluing Thermometer for this. We also recommend that you fine-tune the variable heat control dial and add a mark on the dial at the exact setting which is appropriate for your needs, once you determine it with a thermometer.

6) Set the variable heat control dials for the Oxynate No. 7 or No. 84 and Hot Water Rinse tanks at a temperature higher than the normal operating temperature. This will make it possible to maintain the active, rolling boil required for these two operations. To illustrate: the correct operating temperature for an Oxynate No. 7 bath is 292° F. If we set our Control Unit dial to 292° F, the E/T Heater will heat the Oxynate No. 7 solution until it reaches 292° F. and then shut off. When it shuts off, the solution will stop boiling and will not give us the rolling boil we want. If, on the other hand, we set and mark our Control Unit dial (with the help of an accurate thermometer) to 300° F., the rolling boil will be maintained because the Control Unit will continue to send heat even though the 292° F. temperature has been reached. Because the solution will become more concentrated as water evaporates, its boiling point will rise and the solution's temperature will climb. At this point, add water to the solution to dilute its concentration, and lower its boiling point to the desired 292° F., + or - 2° F. The 300° F. setting also provides a fail-safe. If, for some reason, the solution is not properly attended, the Control Unit will shut off at that temperature and will prevent extreme overheating for at least a short time. If the water continues to evaporate, the over-temperature

sensor will be exposed and will shut down the system. At this point, the sensor will have to be replaced. It is **VITALLY IMPORTANT** that the solution depth be maintained so the over-temperature sensor stays immersed to prevent sensor burn-out.

## TANKS

Because there is no flame control in an electric system, our special Fiberglass Deep Tank can be used for all heated-tank applications, except for bluing with Oxynate No. 7 and No. 84. For bluing with Oxynate No. 7 or No. 84, you must use a Black Iron Tank with welded, not brazed, seams. DO NOT use a stainless steel tank for bluing. Brownells offers our standard 6" x 6" x 40" Black Iron Tank, which was designed for use in our original gas burner system and our 6" x 9" x 40" Black Iron Deep Tank for use with the E/T Heater.

Because the E/T Heater occupies approximately 3" of the depth of any tank in which it is placed, we do not recommend the standard tank unless you are sure you will never need a working depth of more than about 3". In this case, the appropriate E/T Heater is the 4KW model. Because this results in a rather drastic reduction of available depth, we recommend that you use the 6" x 9" x 40" Black Iron Deep Tank which was specially designed for use with the 6KW heater. The working depth in this tank is approximately 5".

### SETTING UP A NEW BLUING BATH WITH THE ELECTRIC TANK HEATER AND 6" x 9" x 40" BLACK IRON DEEPTANK

Follow the instructions found in our Bluing Instructions Booklet concerning tank volume and mixing ratios eg., 3 quarts of water to 10 pounds of Oxynate No. 7, stirring constantly. When the heat generation stops, repeat the process until the tank is a little more than half full (four gallons). At this point, place the E/T Heater carefully into the tank, positioning it so that it is approximately centered, end to end, front to back. Continue adding water and salts until the depth is approximately seven inches. The Deep Tank holds between six and seven gallons of solution when filled to the seven inch depth, with the E/T Heater in place. Turn the power switch to "on" and set the dial to 300° F. (refer to Number 6 under Rules That Must Be Observed). The heating element heats very gently and will not cause burning or eruptions. As the salts heat up and begin to liquify, you can use your stirring paddle to agitate them and speed up the process to a small degree. However, take special care not to scrape or strike the element coils. If the temperature of the bath (as shown on the Bluing Thermometer) approaches the required 292° F. and the solution is not boiling, add water until it does begin to boil. Then, add water and salts in the proper ratio to maintain the rolling boil until the proper working depth is achieved. Because the boil achieved with the E/T Heater is so vigorous, it is recommended that the depth of the solution be maintained at no more than 7". Maintain the proper 292° F., + or - 2° F., by adding water as necessary as the solution boils.

When you have finished your bluing session, simply turn the variable heat control dial back to its lowest setting, and turn the power switch to "off". The boiling action will stop immediately. Under normal circumstances, do not remove the E/T Heater from the tank. If the E/T Heater must be removed for some reason, allow the bath to cool down to approximately 200° F. before removing the E/T Heater. Be very careful, and wear hand and face protection.

Once the bath is set up with the E/T Heater, reheating is as simple as flipping the Control Unit switch to "On" and resetting the variable heat control dial to the 300° F. mark. Do not attempt to break up any solidified salts. Doing so may damage the electric elements. As the salts heat up and begin to liquify, you can use your stirring paddle to agitate them and speed up the process to a small degree. However, take special care not to scrape or strike the element coils.

If you have an existing gas-heated, standard, 6" x 6" x 40" Black Iron Bluing Tank with "cold" salts in place, and wish to convert to the 4KW E/T Heater system, the best way to install the element is: first, use your gas burner to heat up the solidified salts until they are liquid. Place the E/T Heater into the tank. Then, shut off the gas, turn on the E/T Heater, set the Variable Heat Control Dial and continue the operation. Remember, only the 4KW model is recommended for use in Brownells' standard, 6" x 6" x 40" Black Iron Tank.

### PARKERIZING WITH THE ELECTRIC TANK HEATER AND 6" x 9" x 40" FIBERGLASS DEEPTANK

The mixing and operation steps for Parkerizing remain the same as spelled out in our Parkerizing Instructions: no special steps must be taken. We have found that less of the insoluble precipitate common to the Parkerizing operation tends to form with the E/T Heater because it applies heat so gently. When adding atomized steel, use the coffee filter system of holding the steel. If the steel is added directly to the solution with the E/T Heater in place and operating, it may have the tendency to "stick" to the heating elements, causing uneven transfer of heat to the solution. Follow the instructions for Brownells Parkerizing Solutions. With the E/T Heater in the Fiberglass Deep Tank, add water, and turn on the E/T Heater switch on the Control Unit. Set the Control Unit's variable heat control so that it shuts off at 190° F. (using your Bluing Thermometer as spelled out in Number 5 of Rules That Must Be Observed). Because there is no boil involved with Parkerizing, it doesn't matter if the Control Unit is, or is not, sending heat at any given time. Maintaining the required, absolute temperature is all that is important. When the proper temperature is reached, add the Parkerizing concentrate.

When you are done Parkerizing, you can leave the E/T Heater in the solution or remove it, once the solution has cooled down, to allow maintenance of the bath.

**WHEN ALL ELSE FAILS - CALL US AT 800-741-0015**

**Monday through Friday: 8:30 am to 4:30 pm Central Time**

**Tell the operator: "I've got a bluing problem." You will get help!**

One of the unique services we offer all our bluing customers is personal, individual help with the problems you may encounter in your bluing operation. It's something we enjoy doing because we know bluing is an important part of your shop's success, and we want you to succeed every bit as much as you do.

We have over 55 years experience with Oxynate No. 7 Bluing Salts. If you have a problem you cannot solve, please call us. We want to help.

Note: If you do call, be sure to have answers already worked out to the 11 questions listed below, and we will be able to get to the gist of your trouble almost immediately. Wait to call until you have those answers, for we need the information they will give us to track down the problem . . . and we're going to ask you for them.

- 1) What gun are you trying to blue? (See page 13, col. 2.)
- 2) What color is the Bluing Solution, both the liquid and the Bluing Salts themselves? (See page 8, col. 2.)
- 3) Where do you get the water you are using in your Cleaning Solution and your Bluing Solution? (See page 6, col. 1.)
- 4) How old is the Bluing Solution, and how many guns have you blued in it? (See page 9, col. 1.)
- 5) How often do you change Cleaning Solution, and what

Cleaning Solution do you use? (See page 7, col. 1.)

6) What is your operating temperature, and how hard is the Bluing Solution boiling? (See page 7, col. 2.)

7) How often do you add water to the Bluing Solution? (See page 8, col. 1.)

8) How often do you stir the Bluing Solution? (See page 8, col. 2.)

9) How deep is the Bluing Solution in your Bluing Tank? (See page 7, col. 2.)

10) Where is your thermometer mounted in the Bluing Tank, where did you get the thermometer, and is the cannellure (groove) on the stem at least 1" below the surface of the Bluing Solution? (See page 4, col. 1.)

11) Have you done the Cross-Check Test, and what were the results? (See page 14, col. 1.)

Fully 90% of the phone calls we get with bluing problems could be avoided if the bluing room operator would have answered the 11 questions based on what he is doing in his Bluing Room, then checked the Instruction Reference given in parentheses ( ) after each question and found out what he was supposed to be doing instead of what he was doing.

# OXPHO-BLUE COLD BLUING

## RE-BLUING AND TOUCH-UP TECHNIQUES

Oxpho-Blue for rebluing and the touch-up of guns was designed originally for the occasional gun bluer. It does so many things so remarkably well that it is threatening to revolutionize the bluing industry. For looks, the retouched finish was not intended to approach the beauty of the well polished, hot blued gun. It has developed, however, that in the hands of a careful craftsman not only is the Oxpho-Blue finish beautiful, it is also extremely durable and more weather resistant than most other cold blues.

## RETOUCHING WORN BRIGHT AND LIGHTLY-RUSTED SPOTS

There are two simple methods for retouching spots that are worn bright, or are only slightly rusted, where the rust is not serious.

### COTTON PAD TECHNIQUE -

1. Wipe off excess oil and grease. DO NOT attempt to remove all traces of oil from surface of gun. For retouching (ONLY) it is better if a small trace of oil is present on the surface!

2. Dampen a cloth pad, such as a 12 ga. cleaning patch with Oxpho-Blue and vigorously rub the areas which have worn bright until they turn the color desired to blend in with the rest of the gun's finish. You will also discover that the steel actually blues under the oil.

**"SHOE-SHINE" TECHNIQUE** - Many gunsmiths have found that this is a very easy way to retouch a gun.

Dampen a 6" x 10" piece of soft, cotton cloth with Oxpho-Blue and blue the gun, simply going after it as you would shine a pair of shoes. This is an excellent method to prepare low-value guns for resale; or to make a customer's pet gun look attractive when it has been brought in for repairs.

Note: Neither of the two methods above make for an exceptionally durable blue job. Oxpho-Blue is so simple to apply this way, however, taking just a few seconds as it does, that this is not an objection.

## RETOUCHING BADLY RUSTED SPOTS

First the rust has to be removed to be able to do a good blue job. It can either be removed with emery cloth or other abrasive methods, or you can follow the "Steel Wool Technique" explained below, which removes the rust and blues at the same time.

**STEEL WOOL TECHNIQUE** - This technique of using Oxpho-Blue removes the rust and blues the gun at the same time.

1) Take a pad of No. "0" or "00" degreased steel wool and saturate it with Oxpho-Blue. Keeping it saturated, briskly rub the rusted area until all traces of rust are floated off.

2) Without permitting the surface to air dry, wipe it dry with a clean cloth.

3) With a dry piece of steel wool, briskly burnish the area until it turns a bright gunmetal gray color.

4) Take a small cotton pad, dampen it with Oxpho-Blue, and then dampen the area that is a bright gunmetal gray color with the Oxpho-Blue from the pad. Wipe dry with a clean cloth. Burnish with dry steel wool.

5) Repeat Step #4 until the desired color is reached. If you have problems bringing the color up to what you want, review the techniques listed below under "Overall Bluing".

## PROFESSIONAL OVERALL BLUING TECHNIQUE

The following method of applying Oxpho-Blue was developed for overall bluing of a gun, and is particularly designed to give you uniform, even color, no streaking, and a top-quality blue job when you are finished.

Things you will need are:

**OXPHO-BLUE DISH** - A heavy, shallow, small, ceramic or glass/pyrex dish or cup is ideal, as it won't tip over easily. Plastics are okay, polyethylene preferred. Used to prevent contaminating your supply bottle of Oxpho-blue with repeated dippings of the Applicator Pads.

**COTTON APPLICATOR PADS** - Make several cotton pads about 2"

x 2" square, like a cotton makeup pad, or one-fourth of one of our gunsmith's Cleaning Pads for applying Oxpho-Blue.

**CLEAN STEEL WOOL** - Clean Steel Wool is made by removing the protective oil applied by the manufacturer to keep the Steel Wool from rusting during transit and storage. Since the oil will contaminate and possibly cause the Oxpho-Blue blue to streak or discolor, it is imperative to use only Clean Steel Wool when doing an entire gun. For Oxpho-Blue, you will need to clean only with #00 Steel Wool.

Clean the Steel Wool by soaking in a TCE bath. The Steel Wool must be completely dry before using with Oxpho-Blue.

**BROWN PAPER TOWELS** - The kind found in gas station or high school restrooms. Tough, very rough, come folded in thirds, and will take the skin off your hands and elbows. Kitchen paper towels, the slick brown ones on a roll, or anything soft will not work nearly as well; maybe not at all.

## STEP-BY-STEP TECHNIQUE

**1) PREPARE THE SURFACE OF THE METAL** to be blued by polishing to the desired grit level, sand blasting, bead blasting, wire wheel brushing, etc. Do not polish the surface too bright, as the process of applying Oxpho-Blue produces a bright surface and the action of the chemical will be better if the surface is slightly matte in texture before starting. A 140 grit Polish-O-Ray surface is fine; do not go finer than 240 grit Polish-O-Ray.

**2) CLEAN PARTS THOROUGHLY** by suspending them in a fresh 909 Cleaning Solution, or in a soaking bath of TCE or similar chlorinated-hydrocarbon solvent. When trying to get a perfect, no-streak finish on an entire gun, the gun must be absolutely clean and oil-free before beginning. For speed and convenience, we prefer soaking the gun and parts in TCE to setting up and running a 909 Cleaning Solution for the 1-gun-at-a-time being done with Oxpho-Blue.

**3) POUR OUT A SMALL AMOUNT OF OXPHO-BLUE** from your supply bottle into the Oxpho-Blue Dish. Take one of the Cotton Applicator Pads and saturate it in the Oxpho-Blue, but not so liberally that the Oxpho-Blue runs on the surface of the metal when you apply the pad to the gun.

**4) APPLY THE OXPHO-BLUE TO THE SURFACE OF THE GUN**, using long strokes, and being very sure that you don't let the Oxpho-Blue solution run. Turn the gun as you apply to help prevent runs - which turn into streaks.

**5) WATCH THE SURFACE OF THE GUN CAREFULLY** after you get the Oxpho-Blue applied, and the surface of the gun is holding as much liquid as you can apply without runs.

**6) WIPE DRY JUST BEFORE THE OXPHO-BLUE DRIES ON THE GUN.** As you watch, the liquid Oxpho-Blue appears to thicken up and turn a messy, yukky, black color, and seems to be about ready to dry. Just before you think it is going to dry, immediately wipe the entire surface of the gun dry with a clean, soft, dry cloth, using long fast strokes and doing everything you possibly can to eliminate the possibility of streaks. Some streaks are bound to develop, but you can take them out later on in the procedure. Do Not let the Oxpho-Blue dry on the metal surface during the first pass.

**7) WHEN WIPED/RUBBED DRY, BURNISH WITH #00 Dry, Clean Steel Wool.** Once you have the gun rubbed dry, wait a few more minutes for it to air dry thoroughly. Then, with a small piece of #00 Clean Steel Wool, burnish the entire gun so you have removed all traces of any blue color that might have developed during the first application of Oxpho-Blue. What you will have is a grayish-looking, bright surface. If you put on another heavy coat - or a hundred heavy coats - you will end up with nothing more than the same grayish-looking, first coat. Each heavy coat takes off the previous coat and establishes its own surface. So, once you have the metal all-over gray, bright and shiny, the trick is to blacken or "color" this first heavy coat that you have applied, and not put on another coat so heavy that you get back to the underlying gun metal.

**8) APPLY THE "COLORING" COAT OF OXPHO-BLUE.** Dump out the dirty Oxpho-Blue from your Oxpho-Blue Dish and refill with a small amount of fresh Solution from your supply bottle. Tear off a

small piece (about the size of your thumb) of one of the new Applicator Pads and dampen it in the Oxpho-Blue, then squeeze out the pad thoroughly. You want the pad just damp enough that when you rub it on the surface of the gun, the surface stays damp behind the pad, but not wet. Lightly stroke the damp pad over the gun, watching to see that the grayish-looking surface turns black evenly as you wipe over it.

**9) BURNISH ENTIRE GUN WITH #00 Dry Clean Steel Wool.** With dry #00 Clean Steel Wool, very lightly go over the entire gun, being sure the black color is even and there are no streaks.

**10) APPLY LIGHTER, SECOND "COLORING" COAT.** You can apply a much, much lighter second coat of Oxpho-Blue to the gun if you wish. It is difficult to prevent streaking and uneven colors in this second coat.

**11) REMOVING STREAKS; DARKENING LIGHT AREAS.** Occasionally, you will get streaks or small areas which will be lighter in color; or once in a very great while, a gun, for reasons unknown, refuses to take a good color. This can happen when the surface has become "pacified" for one reason or another. If you find spots that did not color, or did not color evenly:

- 1) Position the gun or part as rigidly as possible so it can be rubbed with considerable pressure without bouncing around.
- 2) Make a pad from a small piece of #00 Dry, Clean, Steel Wool about half the size of your thumb. Before using it, squeeze the pad flat between finger and thumb.
- 3) Slightly dampen the #00 Clean Steel Wool pad with Oxpho-Blue. Wet it only enough so that when the pad is used, it will just dampen the surface of the gun.

- 4) Take the dampened, Clean, Steel Wool Pad in one hand, and a well-crumpled Brown Paper Towel in the other hand. First rub the surface you wish to darken with the Oxpho-Blue-dampened, Clean, Steel Wool Pad, and then immediately burnish the dampened spot dry with the Brown Paper Towel.
- 5) If the area is large, or you are doing an entire gun, do only a small 1" x 3" area at a time. Experience will tell you how large an area to attempt, but always keep it fairly small. You can repeat this operation over the entire surface of the gun if you wish, or on as many spots as you find. Done overall, it gives a good, even, lustrous black finish with no visible overlapping.

**12) RINSE GUN THOROUGHLY IN RUNNING WATER,** then shake, air blow or lightly wipe dry. After the blue job has set for a few hours or overnight, oil with Brownells Water Displacing Oil, Pro-Tek Oil, or a good, non-exotic gun oil. Do Not use any of the "Exotic Wonder Oils", for they cause the same problems with new Oxpho-Blue as they do with new Oxynate No. 7 blue jobs. [See page 9, #2.] As time passes, the Oxpho-Blue finish will darken up, seemingly all on its own.

**13) LET THE NEW BLUE "CURE" OVERNIGHT,** after oiling. The next day, wipe off any excess oil with a soft cloth and reassemble the gun.

**14) COLOR BLENDING.** When you simply cannot get the overall uniform color that you want, having tried all of the techniques given above, we suggest you use the "Color Blending" technique used for Oxynate No. 7 bluing jobs. [See page 12, #17] for details.] This has worked well for us in the past.

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## DICROPAN IM COLD BLUING

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**"THE NEW BROWNELL METHOD"**  
**Using the New Improved Formula**

### A PROFESSIONAL, ACCELERATED, HOT WATER BLUING SYSTEM

Dicropan IM has been available to the Professional Gunsmith for many years, but the techniques for applying it have been complex, varied, and not often satisfactory for many shops who tried it. Because it was often difficult to use, we asked our Consulting Chemists to try to do something with the formula that would make it easier to get a perfect job. Essentially, what was done was to take out most of the alcohol and adjust a few of the other components to make the Dicropan IM more forgiving, less likely to permanently streak, and much, much easier to apply.

We then asked our Technical Support Staff to take advantage of this new, greatly improved formula to create an application technique that would work reliably, repeatedly and give the best, toughest, and longest-lasting Hot Water Bluing System available.

The resulting combination of new formula and new technique is absolutely incredible. The New Improved Formula Dicropan IM is so easy to use and so adaptable, and the new application procedure, taking full advantage of these improvements, is so foolproof that we highly recommend it to anyone who wants a superior bluing job without the expense and equipment required for "hot dip" systems.

Dicropan IM is ideal for small shops that have only a few guns to blue; large shops wanting to blue old doubles that wouldn't survive the Oxynate No. 7 Hot Tank, and the serious hobbyists who want to create their own perfect, professional bluing jobs with a minimum of expense and hassle.

When properly applied - that means when these instructions are followed correctly - a Dicropan IM blue job is so tough and so long-lasting that you simply cannot damage it with steel wool. As one of our men remarked, "The only way you're going to get this blue off with Steel Wool is if you can rub it hard and fast enough to make sparks and grind it off!"

Please follow the steps in the order given, and exactly as given.

### EQUIPMENT NEEDED

**TCE CLEANER DEGREASER:** Used in the very first pre-cleaning step to remove grease and oils from the parts being blued, plus used to clean the oil from your Steel Wool.

**909 CLEANING SOLUTION TANK:** Because this is a heated tank,

you will need a Black Iron or Stainless Steel tank and an appropriate heat source (we use a Hot Water Tank Pipe Burner) to bring the Cleaning Solution to operating temperature and maintain it there.

**FLOWING COLD WATER RINSE TANK:** Ideally, it should be set up as a "top-overflow" tank to make it self-cleaning and prevent redepositing residue from the cleaning operation - or the Acid Pickling Solution - on the guns. By keeping the surface cleaned off, the scrubbed gun or part is brought back up through a clean water surface and comes out clean instead of being recoated with the crud just scrubbed off it. This simple modification will solve most of your surface contamination problems and thus your speckling and spotting problems, too.

**BOILING WATER TANK:** This is a heated tank, and you will need a Black Iron or Stainless Steel Tank and an appropriate heat source (we use a Hot Water Tank Pipe Burner) to bring the water to a hard boil and be able to maintain it there.

**DICROPAN IM APPLICATION SWAB:** Two individual ones are needed for each gun you blue. We recommend our Shop Swab (#080-529-040).

a) The first swab is used for the initial coating of Dicropan IM on the metal. The chemical reaction of the Dicropan IM and the steel in this first application leave a muddy slurry on the barrel and the swab, making it too cruddy to use for additional applications of Dicropan IM, and it should be discarded.

b) The second swab can be used for the remainder of the applications.

c) Make each swab by cutting about a 4" length from the leg of a pair of pantyhose, and tying one end closed tightly. Stuff the resulting "bag" tightly with a couple handfuls of cotton balls, then tie a knot in the open end. We make our swabs between 1" to 2" across, (about 1½ times the size of a golf ball). We also make them very firm so when they get wet they retain their size and shape, and hold lots of Dicropan IM solution.

**DICROPAN IM DISH:** A heavy, shallow, small, ceramic or glass/pyrex dish or cup is ideal because it won't tip over easily. Plastics are okay, polyethylene preferred. Used to prevent contaminating your supply bottle of Dicropan IM.

**DEGREASED, DRY, CLEAN, STEEL WOOL:** Is made by removing the protective oil applied by the manufacturer to keep the Steel Wool from rusting during shipment and storage. Since this oil will contaminate the surface of the steel and cause the Dicropan IM Blue to streak and discolor, it is mandatory that only Degreased, Dry, Clean, Steel Wool be used.

## GUNSMITH CLEANING PADS AND "WET STRENGTH" PAPER

**TOWELS:** These 100% cotton pads are ideal for use with TCE, acid, to wipe things dry, and so on. Kitchen paper towels can be used if you get the kind that have "wet strength"; otherwise they disintegrate just when you need them most! We also cover our work bench with these kitchen paper towels to absorb the water and Dicropan IM dripped during the bluing process.

**RUBBER GLOVES:** Must be worn for 3 important reasons: 1) to protect your hands from the hot water and the heat buildup on the metal; 2) to protect the gun parts from your body oils, sweat and other contaminants carried on your hands; and 3) to protect your hands from being stained by the Dicropan IM Solution, or to protect you from allergic reactions if you happen to be sensitive to any of the chemicals it contains. We recommend Playtex-type kitchen gloves (our glove Model NS-35) which give excellent "feel" and stand up well to all the chemicals used in the Dicropan IM process. They're not as tough as the NL-34, N-36, N-54 and Temp-Tec gloves we sell, but the added feel and gripping ability is needed when handling small parts and using the swab and steel wool. We do not recommend surgical-weight rubber gloves because they simply "rub apart" on your hands the first time you card the metal with the Steel Wool.

**WATER DISPLACING OIL:** You will require about a 3" depth in your tank for proper soaking. We strongly recommend you use Water Displacing Oil, for it actually removes every molecule of water and replaces it with a molecule of oil. A 6" x 6" x 40" tank will require about 3 gallons of Water Displacing Oil to achieve a 3" depth. If the 1-Tank Method is being used, 1 gallon of Water Displacing Oil will be sufficient.

**ACID PICKLE:** We consider the Acid Pickle to be a user option. We have tried a number of pieces with and without the Acid Pickle, and could find no particular difference in the way in which the Dicropan IM "took". However, you may well run across a gun that causes you to tear out your hair, and if that does happen, you may be able to get it to blue by using the Acid Pickle. Therefore, we have included the procedure here.

Use either Muriatic or Hydrochloric Acid 32% solution diluted 9 to 1 with water.

## GUN PREPARATION

**1) PREPARE THE SURFACE OF THE METAL** - to be blued by polishing, to the desired grit level, blasting, wire wheel brushing, etc. If the surface is polished, stop with 400 grit Polish-O-Ray. We have found that polishing with Polish-O-Ray or brushing with a wire wheel gives the best surfaces to blue with Dicropan IM. Blasted surfaces are extremely difficult to card, and you cannot get a good job when you try to Steel Wool the parts. Also, we recommend that you do not polish with 500 and 555 grit Polish-O-Ray because they give too highly polished a finish which causes unevenness in density, depth and uniformity of color in Dicropan IM Bluing. (We don't know why, it just seems to happen that way!) All your extra work to get the finer polish will be wasted, and you will not be happy with the finished blue job.

**2) WHEN BLUING DOUBLE BARRELED GUNS** - if there are no drain holes into the cavity between the barrels, drill two  $\frac{3}{32}$ " holes into the cavity through the section of under-rib beneath the forend where they will not show when the gun is assembled. These "vents" relieve the pressure buildup caused when the air trapped between the barrels gets hot and expands in the boiling water, and they drain out any water that seeps between the barrels and ribs.

**3) MAKE A CAREFULLY FITTED, LONG, WOODEN PEG** - to fit one end of the barrel, or design some other type of holding mechanism that is just as effective to avoid touching the barrels during the bluing operation. We use two plugs on double barrels with one plug in each barrel, at opposite ends, so neither barrel is plugged at both ends. We also use a Black Iron Wire loop through parts and barrels so we can hang them easily in the tanks.

**4) MAKE WOODEN DOWELS TO LAY ACROSS THE TANKS** - or install Suspension Racks in the Boiling Water Tank and Water Displacing Oil Tank to keep guns and parts from coming in contact with edges or bottom/sides of the tank. See #13, page 11 for details on building Suspension Racks. We generally use the dowels as "T-Handles" at each end of the Soft Iron Wire. Simply wrap the end of the wire around the center of the dowel tight enough to keep from slipping, and wind on enough wire to make the total length of the wire short enough to keep parts from touching the bottom of the tank.

## 1 AND 4 TANK METHODS

The only difference between the two methods is the number of tanks you use; the steps for applying the Dicropan IM Solution are exactly the same. Therefore, you will need to follow the "change" steps given below under the heading "1-Tank Method" when only 1 Tank was used. When the "4-Tank Method" is used, no changes to these instructions are required, and you can skip directly to the "4-Tank Method" section below.

**1-TANK METHOD:** This simplified, 1-Tank Method uses the same chemicals and procedures as the 4-Tank Method but does so with a kitchen or camp stove (or pipe burner if you have one), as the heat source and only 1 Black Iron or Stainless Steel Tank. This single Tank is used first, to hold and heat the 909 Cleaning Solution, and later, the Boiling Water.

Therefore, in simplest terms, the only thing required is that you dump the 909 Cleaning Solution, flush out the tank, add hot tap water, and bring it to a vigorous boil. We have marked the place for you to make this change with an "\*" below, and have explained what to do. In addition, you will have to provide a Flowing Cold Water Rinse, and the places where this is required are also marked with an "\*".

In the "Starting Up Tanks and Solutions" section, the change required for the 1-Tank Method is marked with an "\*", and is:

**CHANGE 1** \* 2 With only one tank, you cannot start the Boiling Water Tank beforehand. Fill the boiling water Tank only after you have completed the 909 Cleaning solution step and have dumped the 909 Cleaning Solution and flushed the Tank thoroughly with running water.

In the "Step-By-Step Dicropan IM Bluing Technique section, the changes required for the 1-Tank Method are marked with an "\*", and are: (See next column.)

**CHANGE 2** \* 2 Once the cleaned pieces are removed from the 909 Cleaning solution Tank and rinsed thoroughly in the flowing Cold Water Rinse, shake the excess water off the parts and lay them aside on clean paper towels in a safe place. (If minute rust forms on the surface of the metal, it is of no consequence because the parts will begin to rust heavily just as soon as they are put into the boiling Water.)

Next, carefully dump the 909 Cleaning Solution into a heat-proof container for later disposal, or it can be poured directly down a sanitary sewer drain. Be careful, the 909 Cleaning solution is very hot and can cause severe heat burns if splashed on you.

Flush the Tank thoroughly with running water, place it back over your heat source and put enough hot tap water into it to give a minimum depth of 4" of water. Turn on the heat and bring the hot water up to a vigorous rolling boil.

**CHANGE 3** \* 3 Use a sink with a faucet, a bucket with a garden hose or any other flowing water source to completely flush off all traces of the 909 Cleaning Solution.

**CHANGE 4** \* 5 Use a sink with a faucet, a bucket with a garden hose or any other flowing water source to completely flush off all traces of the Acid Pickle Solution.

**CHANGE 5** \* 18 A tank need not be used for this step. Saturate a clean, soft cloth liberally with Water Displacing Oil. Holding the blued parts over a catch container, soak all surfaces of the blued piece with the Water Displacing Oil. Be especially sure to get liberal amounts of Water Displacing Oil inside the barrels, chambers, actions, all other recesses and hidden areas, and on all outside surfaces. The Water Displacing Oil cannot do its job of removing all water and protecting the metal if you don't cover all metal surfaces thoroughly.

## OPERATING INSTRUCTIONS

### STARTING UP TANKS AND SOLUTIONS

**(1) DEGREASE 2 PADS OF #1 STEEL WOOL** per gun to be blued, using the method below. Remember, the Steel Wool Must Be Degreased, Dry and Clean before you use it.

a) Clean the Steel Wool by unfolding the pad into a strip, then sloshing and soaking it in a bath of TCE. This removes the oil better, and helps it to dry much faster. **The Steel Wool must be dry before using with Dicropan IM. Steel Wool still damp with TCE, or otherwise wet or oily will ruin the bluing job completely.**

b) For applying Dicropan IM, you will need at least 2 pads per gun of #1 Degreased, Dry, Clean, Steel Wool prepared before beginning.

\* **(2) FILL BOILING WATER TANK** with fresh clean water. Be sure your water contains no copper, zinc, aluminum or other metallic ions.

Review Technical Information on Water Quality for proper water source. Contaminated water will definitely ruin a Dicropan IM bluing job. \* (For 1-Tank Method, see Change 1, Page 20.)

a) Turn on heat source under Tank. Heat-up time required for full tank to boil: 20-30 minutes, typically.

**(3) START 909 CLEANING SOLUTION TANK** 10-15 minutes before beginning the bluing operation.

a) Mix a fresh batch of Dicro-Clean 909 Cleaning Solution at the rate of 5 ounces (by weight of Dicro-Clean 909) to 1 gallon of water. Do Not keep 909 Cleaning Solution from bluing day to bluing day. Start with a fresh batch each time you make a bluing run.

b) Stir Cleaning solution frequently during heat-up and dissolve. Time required: 10-15 minutes.

c) Stabilize operating temperature at 180° F. Do Not Boil Dicro-Clean 909 Cleaning Solution.

**(4) POUR SMALL AMOUNT OF DICROPAN IM DIRECTLY FROM OUR SUPPLY BOTTLE INTO THE DISH.**

Do Not Dilute or alter the Dicropan IM in any way or this "New Improved Formula" technique will not give optimum results.

**(5) MAKE ACID PICKLE SOLUTION (OPTIONAL).** Use either Muriatic or Hydrochloric Acid diluted to a 10% solution.

a) To make the Acid Pickle Solution: Mix 1 part of 18° Baumé Muriatic Acid or 32% Hydrochloric Acid (same acid; just has two names) with 9 parts of distilled or "deionized/filtered" water. Use Acid strengths listed only; swimming pool acid concentrations are too weak. Acids available from Brownells, or local brick mason's supply store or lumberyard.

b) You must not use an Acid Pickle Solution "dip" because it is very nearly impossible to keep the Acid Pickle out of the bore of the gun, and it will definitely etch surfaces you want left perfect!

**WARNING: Wear face shield, rubber apron and rubber gloves when mixing and/or using any of the chemicals mentioned in these instructions. Use these products ONLY in a well ventilated area. Keep all products Out of Reach of Children.**

**1 WIPE DOWN PARTS WITH TCE** to remove all oil, grease and crud; this includes the bore plus ALL internal and ALL external surfaces and parts. Use plenty of TCE and clean, Gunsmith Cleaning Pads or "Wet Strength" kitchen paper towels to get parts completely clean. For extremely dirty parts, soak in TCE bath, or use an Ultrasonic Cleaning Tank.

**\*2 SUSPEND PARTS IN FRESH 909 CLEANING SOLUTION** to clean again to be sure that all dirt, grease, oil and crud are completely removed. Even minute quantities of oil will cause a "slick" on surface of Boiling Water Tank and streak bluing. So, parts Must be clean so no oil is carried over into the Boiling Water Tank. **Operating Temperature: 180° F. Immersion Time: 10-20 minutes.** \* (For 1-Tank Method, see Change 2, Page 20.)

**\*3 RINSE CLEANED PARTS IN FLOWING COLD WATER RINSE TANK.** Scrub parts thoroughly with Rinse Tank Brush to remove all traces of 909 Cleaning Solution. \* (For 1-Tank Method, See Change 3, Page 20.)

**4 ACID PICKLE.** (If you wish to use this optional step, this is where it goes in sequence.) Remove parts from Flowing Cold Water Rinse Tank, and shake off excess water.

a) Apply the Acid Pickle Solution by holding the part vertically over a catch container (plastic dishpan or Fiberglass Tank is ideal), and swab copious amounts of the Acid Pickle Solution over the part with a Gunsmith Cleaning Pad. Use lots of Acid Pickle Solution and work quickly. As the etch develops, the metal turns gray. Keep applying the Acid until you get an overall uniform texture on the part.

**\*5 RINSE ACID-PICKLED PARTS IN FLOWING COLD WATER RINSE TANK.** Dip and slosh parts thoroughly in Rinse Tank to remove all traces of the Acid Pickle solution. \* (For 1-Tank Method, see Change 4, Page 20.)

**6 SUSPEND PARTS IN BOILING WATER TANK** for 5 minutes from hanging wire and "T" handles, or on Suspension Racks in the bottom of the tank.

**7 REMOVE PART FROM BOILING WATER TANK,** and shake off excess water. Because the metal is very hot, the water will evaporate very quickly. Allow the part to completely air dry. **Do not start the next step until the part is completely dry.**

**8 VIGOROUSLY CARD THE SURFACE OF THE METAL** with a pad of #1 Degreased, Dry, Clean, Steel Wool to remove what light surface rust that formed in the Boiling Water Tank from the action of the free oxygen on the super-clean metal surface. There may be slight discolorations of the metal which will not come off. These seem to clear up later in the bluing procedure, and generally do not affect final color.

**9 APPLY DICROPAN IM TO METAL.** Using one of the swabs that you made, apply the initial coat of Dicropan IM liberally over the entire metal surface. Use swabs-full of Dicropan IM, and don't worry about runs or streaks. Put on as much Dicropan IM as you can for 1 minute, being sure to get lots on the metal. Because of the difference in metal mass within parts - between the barrel and breech area, for instance - you will find that some areas stay wet and others retain enough heat to continue to evaporate the Dicropan IM. In all of our testing, this doesn't seem to make a difference as long as you liberally cover all the metal with Dicropan IM.

**10 SUSPEND PARTS IN BOILING WATER TANK** for 5 minutes from hanging wire and "T" handles, or on Suspension Racks.

**11 REMOVE PARTS FROM BOILING WATER TANK,** and shake off excess water. Because the metal is very hot, the water will evaporate very quickly. Allow the part to completely air dry. **Do not start the next step until the part is completely dry.**

**NOTE:** The following step is the single most important step in the entire Dicropan IM bluing procedure, so before we ask you to do it, we want you to understand how to do it properly - and what the consequences are if you do not. Follow these instructions carefully; if you do not, your job will not come out as well as it can, nor live up to your expectations!

1) After the first application of Dicropan IM to the parts and their removal from the Boiling Water Tank, the parts will be so badly covered with a muddy brown crud, heavy splotches and other discolorations that you will think you are looking at the realization of your worst nightmares about bluing, and that you have a major screw-up. Take heart; such is not the case. The parts are supposed to look like that after the first Dicropan IM application and Boiling Water soak.

2) To remove this crud and corruption, you must do the following steps exactly and completely. If you do not, you will probably end up with staining or discolorations that can only be removed by repolishing and rebluing the part.

a) **THE PART, YOUR GLOVES AND THE STEEL WOOL MUST ALL BE ABSOLUTELY BONE DRY.** Once this crud is dry, if it gets wet from any source, the "mud" will make a permanent stain on the metal that cannot be removed short of repolishing. **DO NOT TOUCH THE PART WITH HANDS OR GLOVES.** If you get a wet spot on the part at this time - from touching it with wet gloves, for instance - or "reactivate" the mud, a permanent stain will probably result. (You even have to dry off your rubber gloves before working with the part.) Holding the part by the wood plug or other rigid, solid holding method (the wires are not rigid enough), vigorously card off the dry crud, rust and corruption with the same pad of #1 Degreased, Dry, Clean, Steel Wool used in Step 8. Pay special attention to any blemishes. Rub them long enough and hard enough to remove the discolorations. Occasionally turn the Steel Wool pad to a fresh working surface for best cutting action. Card, Card and Card - literally rubbing your guts out because you must have the metal perfect at this point. The steel will turn a uniform, shiny gray color that you simply cannot card off no matter how aggressively you rub. The crud comes off as a dry powder.

b) If slight discolorations or blemishes still persist, continue with the bluing process as long as they are not the result of having gotten the metal/crud wet during the carding operation. The staining caused by wetting the metal or re-activating the crud never seems to come out completely, and you might as well stop now and repolish the gun and begin again without wasting any further effort. The other blemishes that are a result of inconsistencies in the steel seem to "blend in" by the time you have completed the second or third application of Dicropan IM.

c) When you are through with the carding in Step 12, throw away both the swab and the steel wool used to apply and card this initial application of Dicropan IM. They are both thoroughly contaminated and cruddy, and you do not want to chance any of the "mud" you carded off being reactivated during a later application. We also change the paper towels on the top of the work bench at this time, too, to make sure no "mud" dust is still around to contaminate your work and cause you grief.

d) Now that you understand what you must do in the next step, proceed to Step 12.

**12 VIGOROUSLY CARD THE SURFACE OF THE METAL** with a pad of #1 Degreased, Dry, Clean, Steel Wool. You MUST DO THIS STEP THE WAY IT IS OUTLINED IN THE "NOTE" SECTION ABOVE.

If you choose not to follow our instructions, you will probably ruin the bluing job and have to repolish and reblue the gun. Therefore, you might as well do it right the first time!

**13 APPLY THE SECOND COAT OF DICROPAN IM TO THE METAL.**

Using the clean swab, apply the second coat of Dicropan IM liberally over the entire metal surface. Use swabs-full of Dicropan IM, and don't worry about runs or streaks. Put on as much Dicropan IM as you can for 1 minute, being sure to get lots on the metal. As before, because of the difference in metal mass within parts, some areas stay wet and others continue to evaporate the Dicropan IM. As long as you very liberally cover all the metal with Dicropan IM, it doesn't seem to make any difference. (You can use this second swab for the remainder of the applications of Dicropan IM.)

**14 SUSPEND PART IN BOILING WATER TANK** for 5 minutes from hanging wire and "T" handles, or on Suspension Racks.

**15 REMOVE PART FROM BOILING WATER TANK**, and shake off excess water. Because the metal is very hot, the water will evaporate very quickly. Allow the part to completely air dry. Do Not start the next step until the part is completely dry.

**16 VIGOROUSLY CARD THE SURFACE OF THE METAL** with the second pad of #1 Degreased, Dry, Clean, Steel Wool that you made. (You can use this pad for the remainder of the carding operations.) The rust will come off as a light, reddish-brown powder. Card the metal very hard and very vigorously. The Dicropan IM blued surface is so tough you simply cannot card it off no matter how aggressively you rub, tho' you may be able to lighten it a little. (Subsequent coats darken these spots.) Occasionally, turn the Steel Wool pad to a fresh working surface for best cutting action. The steel will turn a uniform, shiny blue color that progressively darkens with additional coats of Dicropan IM.

**17 REPEAT STEPS 13 THROUGH 16 UNTIL THE DEPTH OF COLOR DESIRED IS ACHIEVED.** Normally about 5 to 6 coats of Dicropan IM will give a wonderfully deep, blue color. Before proceeding to

the next step, inspect the blued parts very carefully under natural light or under bright, incandescent light (a traditional light bulb, not a fluorescent tube) for any color variations. We have found that very minor blemishes tend to "blend in" during the overnight "curing" in Step 20. If larger blemishes or discolored areas exist, use a new pad of #1 Degreased, Dry, Clean, Steel Wool, and card the bejeebers out of them.

a) Go back to Steps 13 through 16 and apply another entire coat of Dicropan IM to the part and card it thoroughly. Do not try to just touch-up a spot you have carded because you will usually end up with a non-blended area of a slightly different color, and that is what you were trying to cure when you carded the blemished area! We've had very good luck getting these occasional color variations to blend into the rest of the bluing.

**18 SUSPEND PARTS IN WATER DISPLACING OIL TANK.** After the last carding is completed and the color that is wanted is achieved, wipe off the parts with a clean Gunsmith Cleaning Pad and suspend the parts in the Water Displacing Oil Tank. We leave parts in the Water Displacing Oil for a minimum of 30 minutes, although longer is fine if you like. Be sure to put the parts on racks or suspended by a wire to keep them off the bottom and out of the water that has collected there, and on which the Water Displacing Oil is floating.

a) We strongly urge you to use Water Displacing Oil which actually removes every molecule of water and replaces it with a molecule of oil, giving you and your customer the finest rust-proofing protection available in the firearms industry or any other industry! (*For 1-Tank Method, see Change 5, Page 18.*)

**19 DISCARD DICROPAN IN REMAINING DISH:** Do not return it to your supply bottle as you will definitely contaminate your main supply.

**20 REMOVE PARTS FROM WATER DISPLACING OIL AND LET THE NEW BLUE "CURE" THOROUGHLY.** We prefer at least overnight. (Usually the very minor blemishes will have "blended in" during this "curing" period.) The next day, wipe any excess oil off the parts with a clean, soft cloth and reassemble the gun.

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## POLISHING SUPPLIES AND THEIR USE

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Inasmuch as the attractiveness of your completed blue job is largely determined by the quality of your polishing job prior to the actual bluing, too much stress cannot be placed on the polishing equipment to be used.

When making your decision as to which type or brand of polish you are going to buy, always bear in mind that a polish which dries to a hard, brittle surface will invariably cause deep scratches in your work, making it necessary for you to spend untold hours of needless additional polishing to get the finish you want.

Brownells' Polish-O-Ray is the answer to the gunsmith's prayers and dreams. It does not get glass hard, does not emit offensive odors when in use, is exceptionally fast cutting and above all, it is greaseless. Polish-O-Ray can be applied to your polishing wheels when running at operating speeds, thus assuring an even, true cutting surface. It polishes fast and leaves a good, smooth polishing surface that will not gouge the metal.

Practically all the leading gun men of this country and Canada use Polish-O-Ray exclusively in their shops. It is indeed with a great deal of pride that we point to these users and the volumes of praise they write Brownells regarding its superlative qualities.

Polish-O-Ray comes packed in two-pound tubes with metal ends and foil lining to retain the proper moisture content. Before opening the tube, prepare a storage container in the following manner: Obtain a wide mouth jar such as peanut butter is packed in. Be sure the mouth of the jar is wide enough to permit insertion of the tube. In the bottom of the jar, place a piece of cloth or a handful of sawdust. Dampen this so that it feels "damp" but not wet. When the polish is not in use, insert it into the jar with the open end of the tube resting LIGHTLY on the dampened material. If storage is to be prolonged, pack damp paper around the open end of the jar and sides of the tube and store in a cool damp place. (Easy-store plastic bags are supplied with Polish-O-Ray for your storage convenience.)

**Always store in cool place. Refrigerate during warm weather!**  
**HOW TO USE POLISH-O-RAY**

Tear off the unmarked metal cap from one end. Be sure and leave on the end showing grit size. Then, using a pair of pliers, tear the paper down one side of the tube for approximately 1/2". The tube is now ready to be pressed against the polishing wheel.

Before applying the Polish-O-Ray to the wheel, be sure the wheel is in proper condition to receive the polish. For satisfactory performance of the polish and the polishing operation, the wheel must be in balance with the surface true. (See Truing And Loading Section below.) Turn on your polishing outfit and with the torn side of the tube down, press the open end against the face of the spinning wheel. Hold there until sufficient polish has built up on the wheel and then remove the tube with a quick, upward motion.

Once the wheels are broken in they will not throw quite so much polish over the floor and walls when polish is being applied. A certain amount of throwing will always occur, however, so for cleanliness sake, it is best to have dirt catchers above and behind the wheel.

As the polish wears down, apply a little more from the proper tube. Do not try to polish without sufficient polish on the wheels. In damp weather it is often necessary to let the wheel run for thirty to sixty seconds after applying Polish-O-Ray before it will be dry enough to perform properly. Attempting to polish with green polish on the face of the wheel only transfers green polish to the surface of the metal. This must be washed off with water when it occurs.

RPM recommendation: 6" to 8" wheels, 1750 rpm.

### TRUING AND LOADING NEW FELT AND MUSLIN POLISHING WHEELS

If your new wheels are not trued and your polishing motor is absolutely vibration and bounce-free, it is categorically impossible to

turn out first class work. Ripples are going to form on the surface of the parts you are polishing, no matter how hard you try to hold them "steady". The cure is simple: bolt the polishing buffer to its pedestal, and the pedestal to the floor. Make the mounting so solid that when you lean into the buffer at the end of the wheel arbor, nothing will move.

**TRUING NEW FELT WHEELS** - Use our Buffing Wheel Rake or the end of an old file or rasp as your "truing tool", and operating the setup like a wood lathe, face off the wheel until it is running perfectly true on your motor shaft. When you think you have it true, hold a soft lead pencil on the tool rest and just lightly touch the trued surface of the spinning wheel. Remove the pencil and shut off the motor. When the pencil line goes all the way around the wheel face without gaps, the wheel is true.

This job has to be done on all new wheels, for they are never exactly true to center when they come from the manufacturer. And, just like the finest tires you can buy, they must be balanced. You cannot do this job "free hand" with a Cleaning Brick. It should be used later removing old polish from an existing wheel.

**TRUING STITCHED AND LOOSE MUSLIN WHEELS** - Mount 3 or 4, 3/8" individual wheels, or 1, 90-ply wheel, on the arbor as required to make up a working face of at least 1" wide. (Before first mounting Stitched Muslin Wheel, take a sharp knife blade and insert it into the narrow "face" of the wheel, and cut through about the first 2 spirals of stitching, but not deeper than about 3/4"-1". This allows the face to "roll-over" properly.)

Next, put on a dust filter mask, eye protection, a shop apron and a pair of heavy leather gloves. Turn on the buffer and bring up to speed. Hold the Buffing Wheel Rake or a heavy, old, 10"-12" rasp crosswise to the wheel's face and at about the 4 o'clock position, and force it firmly into the face of the wheel. Lint, dust, cut threads and fluff will fly wildly into your face. Persist until you have "broken in" the wheel face and rolled over the sides a little. Turn off the buffer. Clip the longer threads still hanging to the wheel, flush with the face of the wheel to prevent "slap" marks in your polishing job.

**LOADING THE NEW WHEEL** - Turn on the buffer and while it is coming up to speed, tear the unlabeled metal end off the tube of Polish-O-Ray, and enough cardboard tube down one side to expose a wedge-shaped section of Polish-O-Ray. When the wheel is up to speed, turn the buffer off. Hold the tube of Polish-O-Ray at about 4 o'clock to the face of the wheel with the wedge of exposed polish up, press up and into the face of the wheel firmly, slowing the wheel down against the polish. Don't drag buffer down too quickly or you will build a glazed surface that will not cut. Turn the buffer back on and let run at full speed for 2-3 minutes. Repeat the "turn-off-drag-down against the polish" step at least two more times. This gives the first face to the polishing wheels, and from then on, you can reload as discussed above.

## POLISHING PROCESS

A very satisfactory finish for hunting guns can be had by using nothing more than Grit #140 Polish-O-Ray, one soft felt wheel and a one-inch loose muslin wheel (consisting of 3 or 4, 3/8" sections, or 1, 90-ply wheel). Proceed as follows: first, go over all parts to be blued with the #140 polish on the loose muslin wheel until all dirt, old blue, rust, etc., has been removed. Then go over the parts with Polish-O-Ray on a 6" or 8" soft felt wheel to smooth the surface. When all pits and blemishes are removed, return to the muslin wheel and polish out the grit marks created by the felt wheel operation.

The only practice necessary to get a nice finish as described above is in learning how to take the parts from the wheel without grit "slap" marks on the metal. To do this, remove the parts from the wheel (while still turning) with a very fast and snappy, downward motion away from the face of the wheel.

Most gun bluers, however, are anxious to produce guns with a higher polish. This takes more equipment, practice and know-how. A full course in gun polishing is to be found in the book *Gunsmith Kinks*®, (#108-001-001) which gives all details and steps with ample illustrations to simplify the work for you. The following is an excerpt from that chapter.

... "If in working on a gun it is evident that some of the coarse grit steps can be eliminated - because there are no bad pits or rust spots or the like - just be sure to keep in mind that at each successive polishing step all grit marks for each step are removed before going on to the next finer grit . . . and that the direction of movement of the piece across the wheel must be alternated not only with each grit, but most importantly, at the next finer grit. For example, if you start out with a gun in good condition on #240 Polish-O-Ray, polishing at

30 degrees to the bore on the barrel and at right angles on the action, you must polish with the next finest grit polish at parallel to the bore on the barrel and at 45 degrees on the action. Continue alternating directions of polishing and grits through the final polishing with No. 555 on a loose muslin wheel."

### POLISHING AS ECONOMICALLY AS POSSIBLE:

Need: 4 - 6" x 3/8" Stitched Wheels  
8 - 6" x 3/8" Loose Muslin Wheels  
1 - tube each #140 and #240 grit Polish-O-Ray or #240 and #400 grit Polish-O-Ray depending upon condition of gun.

1) Load 3 OR 4 STITCHED wheels with #140 Polish-O-Ray. Travel perpendicular to wheel axis, then parallel with axis on frame/actions.

2) Load 4 LOOSE wheels with #240 Polish-O-Ray. Travel lengthwise, then at right angles to axis to remove all former polishing marks. If working on a shotgun, put the #240 Polish-O-Ray on 4 loose muslin wheels instead of stitched wheels. Gives a "Frosted" look for no-glare in the field. (This 2-grit polishing job is the "Standard" grade finish.)

### "HIGH" MIRROR AND "MASTER" MIRROR FINISH POLISHING:

Need: 3 or 4 Soft Felt Wheels, 6" or 8"  
1 Hard Felt Wheel, 8"  
12 Loose Muslin Wheel Section, 8" to make 3 wheels of 4 sections each  
1 tube each of #140, #240, #400, #500 and #555 Polish-O-Ray in Black, Gray and White

1) ON 6" OR 8" SOFT FELT WHEEL - 1750 rpm - use #140 grit on rough guns; #240 grit on average guns - to remove pits, mars, etc. Travel at 30° to bore on barrel. Travel at right angles on action.

2) ON 6" OR 8" SOFT FELT WHEEL USE #240 GRIT following #140 - or #400 on a 6" or 8" Soft Felt Wheel following #240 - and polish parallel to bore on barrel and at a 45° angle on action. Remove all former polishing marks.

3) ON 4, 6" OR 8" LOOSE MUSLIN WHEELS USE #400 GRIT at right angles to the entire gun to remove all former polishing marks. If you are working on a rough gun on which you started with #140 Polish-O-Ray on soft felt, then #240 on soft felt, be sure to use #400 on soft felt before using the #400 on loose muslin.

The gun can now be blued for a good, standard finish without using finer than #400 grit.

4) FOR "HIGH" MIRROR FINISH, continue with the optional #500 grit on a 6" or 8" Soft Felt Wheel, polishing at 45° to the bore. Follow this with #500 grit on Loose Muslin Wheel and travel at right angles to remove all grit marks.

5) ON 8" HARD FELT WHEEL USE #555 POLISH-O-RAY at 45° angle to bore on entire gun and remove all the #500 grit polishing marks. DO NOT overheat.

6) ON 4, 8" LOOSE MUSLIN WHEELS USE #555 GRIT and polish either parallel or a right angle to the bore. Continue - without overheating - bringing the gun to mirror finish. (This is the "Master" grade finish - the very best.)

### NOTES:

1) Muslin wheels should be at least 1" wide or more at periphery. Stitched muslin wheels can be used instead of Felt, but Felt Wheels give a smoother finish.

2) Do not attempt to use but one wheel and change grits on that wheel. It is physically impossible to remove all former abrasive particles. These will make scratch marks in later steps, requiring your starting all over again to remove them.

3) Be careful at all times to NOT funnel screw holes or round corners on frames and actions.

4) Using a marking pen, mark direction of rotation of wheel when polish was applied. Always return wheel to polishing motor with arrow pointing the right direction for rotation.

5) When using #555 or any other grease-type polishing compound, do not get the surface of the metal parts too hot while polishing or the pores will open and some of the polish will actually penetrate the surface of the metal. This is called "lapping". When this happens, the finished blue job will have light and dark streaks. The only cure is to repolish with #400 grit Polish-O-Ray and redo the balance with the #555. The way to check to see if you are getting too hot is by sense of touch. When it is hot to the touch, you are in trouble. Another positive check is when the polish commences to pile up on the surface of the metal and form a hard crust that is difficult to remove. Just use less pressure and slow down your movement of pieces across the polishing wheel.

## ITEMS TO CONSIDER BUYING FOR POLISHING

**POLISH-O-RAY** - In standard grits from #140 to #500 and No. 555 (in either White or Gray for fast or slow cut).

**POLISHING OUTFIT** - For the once-in-a-while job, a bench grinder can be rigged to work. Otherwise, make up a good rig or buy a pedestal polisher. Whatever you use, it must be bolted down SOLID. Any vibration at all will show up as ripples in your finished bluing job, regardless!

**LOOSE MUSLIN WHEELS** - Used to buff out the grit marks created when using felt and/or stitched muslin wheels.

**STITCHED MUSLIN WHEELS** - Can be used instead of Felt Wheels, but Felt Wheels give a smoother finish.

**FELT WHEELS** - Use when the very best possible polishing wheel surface is required or desired. Because of square edge between sides and polishing face of Felt Wheel, it allows you to polish dead flat surfaces and up to corners better than can be done on a Stitched Muslin Wheel on which the polishing face flares and the edges roll over. Gives a smoother finish.

**GOOD ASSORTMENT OF FELT BOBS** - For inside triggerguards, around actions, along ribs and flutes, in sharp hammer recesses, etc. Generally, used with #140 or #240 grit Polish-O-Ray.

**BUFFING WHEEL RAKE** - A cleverly designed tool to square-off and break in the polishing face of Muslin or Felt Wheels. Essential equipment for any polishing operation.

**HOLD** - Many, many gunsmiths find that they will polish a gun, or series of guns and get them ready for bluing, but it could be several

days before they can actually blue. During this period the highly polished guns are very subject to rust but you **MUST NOT** use any of the exotic "wonder oils" on them at this time or they probably will not blue in the Bluing Solution! **HOLD** was developed for this type of situation. It will fully protect the guns during this "holding" period and save time and headaches.

**EYE GOGGLES AND FILTER MASKS** - Required for your personal safety and protection.

**GUNSMITH KINKS® Vol. 1** - Chapter 5, Pages 202 to 244 are devoted exclusively to the art of gun polishing, with complete illustrations on "how-to". Worth years of experience!

**ENCYCLOPEDIA OF MODERN FIREARMS, PARTS AND ASSEMBLY AND THE NRA ASSEMBLY AND DISASSEMBLY BOOK** - Taking a strange gun down can present problems. Putting it back together a week or two later can almost amount to a catastrophe if you do not have some sort of a guide to help you. These three books should be close, *very* close, to your work bench.

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# Bluing Frequently Asked Questions

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Brownells staff of professional gunsmiths has answered thousands of bluing questions over the years. We've included some of the most commonly asked ones here to help save you time and trouble. If you have other questions about bluing, Parkerizing, metal preparation, related products or other firearms questions not covered here, please feel free to contact our technical support staff.

**FOR TECHNICAL SUPPORT - CALL US AT 800-741-0015**  
Monday through Friday: 8:30 am to 4:30 pm Central Time

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## HOT BLUING

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**Q:** What should I do to ensure I get good metal finishes when I start bluing?

**A:** In addition to following the instructions of the materials you use, the key to turning out good finishes is to spend the time cleaning the metal thoroughly. Then, practice on scrap steel **BEFORE** you consider attempting to work on a firearm. Until you can consistently get good results with scrap steel, it can often be a waste of time and resources to start working on firearms. Also, you run a very real risk of ruining a good firearm!

**Q:** What is the red smut I occasionally find on some blued items in my salts tank?

**A:** The red smut is depleted salt residue that has come out of suspension in the tank and settled on the workpiece.

**Q:** Will the Oxynate No. 7 salts harm the stainless steel front sight bead on my Remington 1100, or will the bead damage my salts?

**A:** The Oxynate No. 7 will not have any effect on the stainless steel bead on your Remington 1100, nor will the bead have any negative effect on the salts bath.

**Q:** What can cause gray streaks on parts that have been blued in a caustic salts solution?

**A:** This can sometimes be caused by the presence of dirt or oil on the parts when they were placed in the salts bath. More effective cleaning will eliminate this problem. Dicro-Clean No. 909 (#082-005-008) is an excellent parts cleaner for the bluing process.

**Q:** How can I add water to my salts bath without so much splatter?

**A:** Many people have found that adding ice will cut down on splatter.

**Q:** I have a rifle that has a modest amount of bluing wear in certain areas. I want to re-blue it, but I do not want to re-polish the entire gun. Is it necessary to remove all the original finish?

**A:** It is possible to blue over existing bluing, but we do not encourage it. Bluing material, whether it is a cold blue or a caustic salt, will be reacting to two different surfaces; one that is blued and one that is bare metal. This will generally lead to differences in the final color. Sometimes this can be quite subtle,

but sometimes it is very apparent. It is best to work with a uniform surface to obtain a consistent, uniform color.

**Q: When bluing a barrel with a caustic salt such as Oxynate No. 7, will bluing the bore have any negative impact?**

**A:** During World War II, the U.S. Ordnance Department did some extensive testing to determine if bluing would have any negative effect on a barrel bore. Their conclusion was that it had no significant impact at all, so you shouldn't encounter any problems with this process.

**Q: The instructions with Oxynate "S" state that it should only be added to an old or used bath. What would happen if I added it to a new bath?**

**A:** Adding Oxynate "S" (#082-029-016 or #082-030-032) to a new bath would ruin the bath. Your solution will turn gray and will no longer blue properly.

**Q: What is the most common cause of killing or ruining a salts bath?**

**A:** The most common cause of ruining a salts bath is overheating the bath. Any time you exceed 310°F, you run the risk of damaging the salts bath.

**Q: What color finish will I obtain when bluing with Oxynate No. 7?**

**A:** Under normal conditions, Oxynate No.7 salts (#082-007-140) will provide a black finish to the metal surface.

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## POLISHING & METAL PREPARATION

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**Q: When should I draw file a barrel?**

**A:** If the exterior of the barrel is heavily pitted, we have found that it is best to draw file the surface prior to using a polishing wheel.

**Q: I'm having trouble getting Polish-O-Ray to stick to the wheel when I am polishing. It is okay when starting, but I cannot recharge the wheel after I start. My buffer is a converted bench grinder. What is wrong?**

**A:** Most bench grinders work at 3200 to 3800 rpm. This is much too fast for most buffing. You need a wheel rpm of 1750-1800 for use with 8" and 10" wheels. When trying to charge a large wheel spinning at 3200+ rpm, the polish ends up slinging everywhere but where you want it. Try a slower motor or use a 2 to 1 pulley reduction system to slow down the speed of your wheels.

**Q: After I polish my work pieces, it may be some time before I can actually do my bluing. How can I keep them from rusting?**

**A:** We strongly recommend the use of Hold (#082-023-128). This preservative is designed to prevent rust prior to bluing. It is easily removed with Brownells Dicro-Clean No. 909 (#082-005-008).

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## STAINLESS STEEL & PARKERIZING

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**Q: I am currently refinishing an M1 Garand. I had the barrel and a number of other parts re-blued. One of the pieces would not take the bluing. I want to try to Parkerize this piece. Do you have a Parkerizing kit that does not require special equipment?**

**A:** The one part of the M1 that usually does not blue is the gas cylinder. It is made of an alloy that does not blue or Parkerize. Apparently, the originals were iron-plated and then Parkerized. Our recommendation is that you either blue the component in question using a product like Oxynate No. 84 (#082-084-140) designed for stainless steel, or use a spray-on/bake-on finish like Brownells Matte Black Aerosol Baking Lacquer (#083-046-801) or Aluma-Hyde II (#083-002-012), which requires no baking but does take several days to cure. Oxynate No. 84 is a hot, caustic process which does require a significant investment in equipment.

**Q: Do you offer a touch up for Parkerizing?**

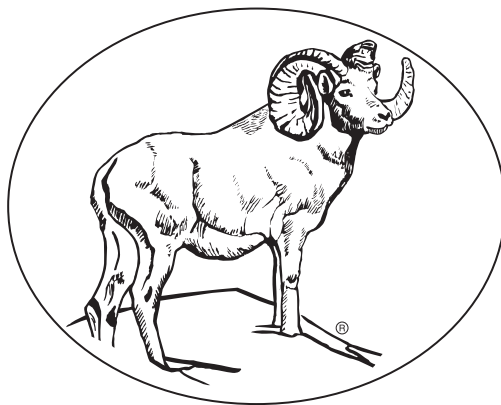
**A:** Unfortunately, we do not know of a commercially available touch up for Parkerizing.

**Q: Do you have, or know of a cold blue that can be used on stainless steel?**

**A:** At the present time, we are not aware of any commercially available cold blue that will color stainless steel.

**Q: How can I determine if a gun part is stainless steel?**

**A:** An easy method of determining whether a firearm part is made of stainless steel is to apply a bit of cold blue with a swab. If the part is stainless steel, it will not color. You should be careful with this, however, because if the part has been plated it would not color with a cold blue either.



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