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MANGANESE and ZINC PARKERIZING INSTRUCTIONS

by
the Crew at Brownells, Inc.
With assistance from Bob Parker*
Plus
An Historical Perspective on Color by Scott Duff

INTRODUCTION

Brownells has chosen to offer both manganese and heavy zinc Parkerizing systems. They both have advantages for different applications. Manganese offers the best resistance when used as the final finish. Heavy zinc has proven to be the best "undercoat" for use with spray-on/bake-on coatings.

Phosphate coatings, better known in the gun trade as Parkerizing, have been around in one form or another since the late 1800's. The process was, and is, used primarily as an industrial coating and many times as an undercoating, or primer, for paint, waxes or other protective coatings. The U.S. military recognized this type of coating as the perfect finish for their weapons very early on. It is non-reflective, wears well, and due to its oil trapping ability, is outstanding in inclement weather.

Until recently, the primary non-military market for this type of coating has been collectors of military rifles who wish to restore their rifles to an original-type finish. The next wave of interest came with waterfowl hunters who realized the corrosion resistance available with a phosphate coating. Today, smart hunters recognize that Parkerizing is a particularly good finish for field guns. Its durability, moisture resistance, and non-reflective nature makes it the logical finish for the working gun.

The coating is applicable to practically every type of firearm steel, except stainless steel. It will not work on aluminum or brass. The color achieved, and its depth, are variable, depending on the particular steel alloy. The color, fresh from the Parkerizing Tank, is best described as a dark, charcoal gray; not olive drab as many believe. The green/brown color often associated with vintage military weapons is actually a result of the type and color, or subsequent aging and oxidation, of the lubricants and preservatives commonly applied to those guns, such as Cosmoline®, along with remnants of linseed oil, bore cleaner, sweat, and ordinary dirt.

It is the ability of a phosphate coating to hold lubricants and rust preservatives that makes it such a practical firearms finish. The coating actually creates capillaries and micro-cavities which retain oils and rust preventive compounds. In addition, it cushions moving metal parts against scoring and scratching, and it insulates the metal against electro-chemical corrosion. Plus, the phosphate coating inhibits the spread of corrosion from a damaged area to a sound area adjoining it. Phosphate coatings are stable and resistant, plus their non-metallic structure allows them to absorb and retain rust-preventive compounds better than untreated steel, or other common finishes.

Most metal phosphates are insoluble in water, but soluble in acids, which is the basis for a phosphate coating reaction. Brownells Parkerizing Solution consists of metal phosphates dissolved in a carefully balanced solution of phosphoric acid. As long as the acid concentration of the Parkerizing Solution remains above a critical point, the metal phosphate remains in solution. When the steel is immersed in the phosphating solution, a light acid pickling takes place and the acid concentration is reduced at the liquid-metal interface. It is here, at this surface, that the steel from the gun is dissolved, hydrogen is released, and a phosphate coating is deposited onto the steel. The fact that these coatings are formed in place at the surface of the steel, incorporating metal ions dissolved from the surface itself, makes them "conversion" coatings which are integrally bonded to the metal. In this respect, conventional hot bluing is another form of this type of "conversion" coating, making an integral bond to the metal surface. Phosphate coatings differ from electrodeposited coatings which are "additive" coatings, overlaid on the metal.

While the chamber and bores of rifles and handguns should be protected from the Parkerizing action, other operating parts can be coated with no worry about dimensional change. Any excess, built-up coating is essentially removed in the very early stages of use, after reassembly, and the parts return to their original dimensions.

There are several types of phosphate coatings available in industry, including iron-, zinc-, and manganese-based solutions. Zinc- and manganese-based are the types usually associated with firearms finishing. Brownells has chosen to offer both manganese and heavy zinc Parkerizing systems. They both have advantages for different applications. Manganese offers the best wear resistance when used as the final finish. Heavy zinc has proven to be the best "undercoat" for use with spray-on/bake-on coatings.

<u>Mangenese:</u>

1) It has a very heavy crystal structure that gives a coarser and more porous finish than other phosphates.
2) A manganese phosphate application results in a heavy coating of 1,000 to 4,000 mg/sq. ft. of coating weight.
3) Once applied, it retains a greater volume of lubricating or rust preventive products.
4) Once mixed, the Parkerizing Solution is very long-lasting.
5) The Brownell Parkerizing Solution meets standard mil-spec MILL-STD-171 for small arms finishing.

<u>Heavy Zinc:</u>

1. Very heavy, definite crystal structure.
2. 1000 to 3000 mg/sq. ft. of coating weight.
3. Excellent surface for paint adhesion and for holding lubricants and rust preventive compounds.
4. Very little sludge build-up in the tank. Very user friendly.
5. Less cost involved in bath makeup.
6. Excellent corrosion resistance under paint and spray-on/bake-on coatings.

Although some Parkerizing action will take place on steel parts regardless of the degree of surface preparation, the more highly polished the surface, the thinner the resulting coat will be. Our recommendation is that all parts be given a blasted finish, using glass

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Frank Brownell

beads, fine silica sand, aluminum oxide, or silicon carbide media; or a brushed surface using buffing wheels loaded with 60 or 80 grit polish. A Scott Murray wheel with the coarse belts can also give you this desired finish. The primary reason for the rough surface preparation is to provide more surface area for the phosphate coating to work on, and it will result in a denser, coarser coating. Coarse finishes have more microscopic hills and valleys caused by the coarser abrasive grit "gouges" not being leveled out. Thus, many more times surface area is available to be conversion-coated than on surfaces where all these peaks and valleys have been leveled out.

PARKERIZING COLORS

An Historical Perspective by Scott A. Duff

If you want to start an argument among collectors of U.S. Military Small Arms ask: "What color Parkerizing is original?" This seemingly simple question will provoke endless discussion, and provide a wider variety of answers than one could assume possible. Research conducted in the preparation of several M1 rifle related books has provided the opportunity to examine thousands of Garands, including hundreds of rifles in original configuration. Observations indicate the color of the Parkerized finish varied with the conditions under which the Parkerizing was applied, the era of the rifle's manufacture and the condition and length of time they were stored. Specific factors affecting the color resulting from the Parkerizing process include the type of phosphate used, the temperature and duration of the process, the saturating oil bath, and the preservative coating's reaction on the compounds contained in the Parkerizing. In addition, the method and chemicals used in heat treating and the specified hardness of the individual component also affected the finish color. For instance, a softer metal has a darker finish than a harder one. Descriptions of variations in color and shade are subjective, and the same finish may be described differently by two different people. With that in mind, original finishes have been observed which are: charcoal black, gloss black, black with a noticeable green tint, dark olive green, a light, almost translucent gray, and translucent gray with a green cast. The earliest original rifles examined are in the collection at Springfield Armory National Historic Site. These rifles, serial numbers 81, 87, 79115, 100,000, 1 million, 2 million and 3 million, are in "as-new" condition. They were deemed of historical significance, and generally transferred directly from the factory to the museum shortly after manufacture. They all are of charcoal black color. Early production Winchester M1's are of the same color. None of these rifles have been coated with Cosmoline or saturated with oil. It is interesting to note that M14 rifles were not subject to Cosmoline coating and are the same color as these early Garands. Other M1 rifles manufactured during this era which have seen service, have been observed to be of gloss black or dark green finish. It is believed that the gloss black is primarily a result of repeated cleaning with solvent and oil-soaked rags which gave an almost polished effect to the finish. The frequently encountered, dark green Parkerized finish is believed to be primarily a result of the compounds present in the Parkerized finish chemically reacting to the Cosmoline used for corrosion prevention during long term storage. Observations of original Garands manufactured by Springfield and Winchester indicate a change in the finish color from black to a translucent gray during the late summer of 1944. The Parkerizing process used to finish M1's of post World War II manufacture appears to have returned to the charcoal black finish. If the rifle has been stored in Cosmoline, a green tint may be noted, So, what color Parkerizing is original? Most "as new" Garands are charcoal black. Original finishes of gloss black, black with a noticeable green tint, dark olive green, a light, almost translucent gray, and translucent gray with a green cast have been observed. The variables mentioned above and more than fifty years of use and storage make it impossible to give a specific answer. However, one thing is certain; the argument among collectors and aficionados will continue.

TO PLUG OR NOT TO PLUG THE BORE

It is Brownells recommendation that if the firearm is intended to be fired, the bore should not be Parkerized. The smooth surface of the bore will only take a thin Parkerized coating and part of the coating can be removed with a stiff bore brush and by shooting. The problem lies with the fact that the Parkerizing action will etch the bore to some degree. This etching will cause an increased tendency to foul and in all likelihood, degrade accuracy. In addition, all other things being equal, an etched bore will result in higher pressures than a smooth bore. So, Brownells recommends that all bores should be protected from the Parkerizing process. (A possible exception would be chrome-lined bores, which, if in good tight condition, are unaffected by the process.) Recommended plug materials are soft wood, neoprene, or other synthetic materials. Gas ports in autoloading firearms must also be plugged. The easiest way to plug these port holes is to use round toothpicks, driven solidly in place.

PROCESSING STEPS

The sequence of operation consists of the following steps:

1 - Prepare parts with the desired finish.
2 - Clean the properly prepared parts in Dicro-Clean 909™, scrubbing if necessary, to remove traces of rust-inhibiting compounds, such as Hold™, and also to remove any remnants of the blasting or abrasive media.
3 - Rinse and scrub in clean, flowing, cold water.
4 - Rinse in boiling water.
5 - Immerse in Brownells Parkerizing Solution.
6 - Rinse and scrub in clean, flowing, cold water (same tank as #2).
7 - Immerse in Post Treatment Solution or apply paint, baking lacquer or hot blue to the parts.
8 - Inspect and reassemble.

EQUIPMENT REQUIREMENTS

If you already have a bluing operation set up, you have much of the equipment necessary to apply Parkerizing. In any case, like bluing, the Parkerizing area must be isolated from the rest of your shop. There is a considerable amount of steam generated by the Cleaning and the Hot Water Rinse Tanks, and the steam from the Parkerizing Tank is corrosive.

VENTILATION: It is likely that some acid vapors are being emitted from the heated Parkerizing solution. Therefore, general ventilation sufficient to provide 6 room air exchanges per hour, or local ventilation with a minimum 3500 cfm draw, or laboratory hood or enclosure with 60 lfm air velocity is recommended.

HOT CLEANING TANK: The Brownells 6" x 6" x 40" Bluing Tank with the Hot Water Cleaning Tank Pipe Burner is fully adequate. If you are working with handguns only, or have no need for such a large tank, Half-and Quarter-Tanks are also available. Porcelain canning pots, or similar-sized tanks used with electric hot plates or gas rings are perfectly satisfactory; also, Dicro-Clean 909's optimum operating temperature is 180° F., so only moderate heat is required. (Note: The Hot Cleaner Tank used with a hot bluing operation can be utilized to decrease the number of tanks you have to get.)

FLOWING WATER RINSE TANK: This tank can be any container large enough to hold the guns. It can be metal, fiberglass, rubber, plastic, or porcelain-coated. You only have to set up one Flowing Water Tank because the constantly changing water keeps it clean between steps.

Ideally, the Flowing 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 post-Parkerizing rinse - on the gun parts. 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 from it. This simple system will solve most of your contamination problems and will help in getting consistent, predictable finishes.

The Flowing Water Rinse Tank can be built in several ways; following are three suggestions to help you build yours:

1) Set the Flowing Water Rinse 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 Flowing Water Rinse 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 Flowing Water Rinse Tank forcing the old water up, over the sides of the Flowing Water Rinse Tank, into the overflow container and down the drain. In doing so, all residue from the 909 Cleaning Solution or the Parkerizing Solution is constantly being flushed out of the Flowing Water Rinse Tank, ensuring a continuous and adequate supply of clean, fresh water for rinsing. Set the Flowing Water Rinse Tank so the water flows evenly over the top edge - all around the top edge - to prevent dead spots of old water in the Flowing Water Rinse Tank. Use a medium water flow.

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

3) Install the Rinse Tank Overflow Kit in one end of a metal or fiberglass tank, connect to a piece of garden hose and route the overflow water to a convenient drain. Be sure to keep a continuous and adequate supply of fresh, clean water coming into the tank to keep the Flowing Water Rinse Tank's surface flushed clean.

If A Top-Overflow Is Not Practical, You Can:

1) Use an ordinary tank and dump and refill after each rinse, making sure no residue remains to contaminate parts during the next use.

2) Part can be rinsed simply by holding them under a fast moving stream of water, or better yet, a heavy-flowing sprayer head.

HOT WATER RINSE TANK: The Brownell 6" x 6" x 40" Black Iron Bluing Tank with the Hot Water Cleaning Tank Pipe Burner is ideal. For working with handguns or smaller parts, Brownells recommends Half-or Quarter-Tanks with the corresponding length Hot Water Pipe Burner.

POST TREATMENT SOLUTION TANK: This tank can be made of metal, plastic, or fiberglass. The Post Treatment Solution can be stored in a metal or plastic tank but if the Brownells Gel-coated Fiberglass Tank is used, store the Post Treatment Solution in plastic jugs between uses as the solvents contained in the Post Treatment Solution will cause the gel-coat to loosen over time.

PARKERIZING TANK: The most convenient tank to use is the Brownells Stainless Steel Tank or the Stainless Steel Half-Tank, along with the appropriate size Hot Water Pipe Burners or, if you have a hot bluing system, the larger Bluing Tank Pipe Burner will do as well. The full-size tank can be used for all sizes of parts including barreled actions. A very economical and perfectly satisfactory setup for handguns and parts can be made using a porcelain enamel canning pot, found at most hardware or housewares stores. The ideal heat source for the canning pot is a gas-ring. This setup can even be used for the occasional long gun. How this is done will be explained later. Do not use the Brownells Black Iron Bluing Tank, because the tank itself will be Parkerized, dramatically shortening the Parkerizing Solution life and building up a very undesirable and excessive amount of sludge.

DIFFUSER PLATE: It is highly recommended that a ⅜" steel plate be placed between the Parkerizing Tank and the burner flame, regardless of which type of tank you use for the Parkerizing phase, to act as a heat/flame diffuser. Without this Diffuser Plate, hot spots tend to develop across the bottom of the Parkerizing Tank, which can cause the naturally occurring residue formed during the Parkerizing process to bake onto the inside of the Parkerizing Tank, making it very difficult to remove.

THERMOMETER: You must use an accurate thermometer in your Parkerizing Tank. We recommend the Brownell Bluing Thermometer or a good quality laboratory thermometer to assure exact temperature. Do not use an alcohol-filled cooking or kitchen thermometer and, most meat thermometers are simply not accurate enough. Since temperature control is critical, don't guess at the temperature of your Parkerizing Solution. Use the Brownell Bluing Thermometer, and use it often.

SMALL PARTS HOLDER: An excellent holder for small parts is the Bob Parker-designed Screw and Pin Holder, made from a piece of HDPE plastic, cut from a bleach bottle, or similar container. Simply make small cuts in the plastic just big enough to poke pins and screws through. It will actually tighten up when in the heated Parkerizing Solution. The holder will not contaminate the cleaner or the Parkerizing Solution, and can be used over and over again. A basket made of stainless steel screen is ideal, as is the golf ball-sized Brownells #627 Small Parts Basket.

WATER QUALITY: Of all the metal finishing products offered, the Brownells Parkerizing System is probably the least critical in terms of water quality requirements. Generally speaking, if the water is safe to drink, it is probably OK to use in a Parkerizing Solution.

TECHNICAL INFORMATION ON MIXING & USING THE HOT CLEANING SOLUTION

To mix one gallon Hot Cleaning Solution:

1) Mix 8 oz. by weight (approximately one cup by volume) of Brownells Dicro-Clean 909 per gallon of clean water.

2) Heat to 180° F. and stabilize temperature.

3) Suspend parts in the Hot Cleaning Solution Tank for 10 to 15 minutes.

TECHNICAL INFORMATION ON MIXING THE MANGENESE PARKERIZING SOLUTION

To mix one gallon of Mangenese Parkerizing Solution.

1) Measure exactly 114 oz. of water and pour into your Parkerizing Tank. The Parkerizing Tank must be a stainless steel or porcelain-lined container.

2) Turn on the heat and bring to about 140° F., (minimum 120° F., maximum 160° F.).

3) Measure 14 oz. (by volume) of Mangenese Parkerizing chemical, straight from the jug, and add to the heated water. Mix thoroughly with a stainless steel or heat-resistant nylon or plastic spoon. Measure the depth of the Parkerizing Solution using a stainless steel ruler, or measure from the top of the Parkerizing Tank to the top of the Parkerizing Solution. Write down this measurement as a reference, so this depth of Parkerizing Solution can be maintained. At this stage, the Parkerizing Solution in the Parkerizing Tank is a transparent light green.

Directions For Mixing Replenish Solution

At this stage, mix up another gallon of Mangenese Parkerizing Solution (14 oz. concentrate to 114 oz. cold water) and set aside in a plastic jug. This will be used to replace Parkerizing Solution lost in decanting (see General Maintenance).

4) Age the Parkerizing Solution. Note: This step is done one-time only. Iron is added to the Parkerizing Solution only on initial mix-up to age and condition the Parkerizing Solution, otherwise the first items processed will have thin coating and will not retard wear very well. Aging and conditioning is done to prepare the Parkerizing Solution to do its work, and is not done again until the entire Parkerizing Tank of Parkerizing Solution is replaced.

While maintaining the Parkerizing Solution at 140° F. (minimum 120° F., maximum 160° F.) add .32 oz. (by weight) of powdered iron (remember, .32 oz. of powdered iron *per each* gallon of Parkerizing Solution). If you have a powder scale, .32 oz. is exactly 140 grains. If you are using measuring spoons,. 32 oz. is approximately ⅔ teaspoon. The best way to add the iron is to place it in a common coffee filter (like Mr Coffee), with the sides drawn up and tied together with black iron wire at the top, forming a bag, and suspend it in the Parkerizing Solution. There will be only slight visible reaction at this point, with only minimal bubbling on the surface of the bag. Hold the Parkerizing Solution in this temperature range (120° F. to 160° F.) for one hour, swishing the bag back and forth the length of the Parkerizing Tank every 4 to 5 minutes, followed by stirring with a chemically resistant plastic or stainless steel spoon.

After 30 minutes or so, light-colored flakes will begin to form in the Parkerizing Solution. This is normal, a result of the chemical reaction between the Parkerizing Solution and the iron in the bag. Keep stirring and swishing for the entire hour. At the end of the hour, remove the bag from the Parkerizing Solution and dispose of it.

NOTE: The powdered iron can be added without using the filter bag by just sprinkling it on top of the Parkerizing Solution, however, we do not recommend it, as it is difficult to keep the iron from sticking to the bottom of the Parkerizing Tank and causing a buildup of hard residue. This hard residue can be extremely difficult to remove, and can result in hot spots and possible eruptions.

Remember, any attempt to Parkerize without performing this aging step will result in a thin finish with poor durability. DO NOT ADD ADDITIONAL POWDERED IRON DURING THE LIFE OF A PARTICULAR BATH.

--**5)** Heat to 190-195° F., add water lost in evaporation, (determined by measuring the level of Parkerizing Solution in your Parkerizing Tank, and bringing back to the initial measurement), and stabilize at this temperature. [Note: Properly mixed, the Parkerizing Solution will boil at approximately 210° F. Avoid boiling the Parkerizing Solution. Boiling causes the water to evaporate rapidly, requiring continual replenishment. Boling also generates an excessive amount of sludge buildup, and may also induce eruptions of the bath. There is nothing to be gained in heating the Parkerizing Solution beyond 195° F.]

TECHNICAL INFORMATION ON MIXING THE HEAVY ZINC PARKERIZING SOLUTION

To mix one gallon of Zinc Parkerizing Solution.

1) Measure exactly 124 oz. of water and pour into your Parkerizing Tank. The Parkerizing Tank must be a stainless steel or porcelain-lined container.

2) Turn on the heat and bring to about 140° F., (minimum 120° F., maximum 160° F.)

3) Measure 4 oz. (by volume) of Zinc Parkerizing chemical, straight

from the jug, and add to the heated water. Mix thoroughly with a stainless steel or heat-resistant nylon or plastic spoon. Measure the depth of the Parkerizing Solution using a stainless steel ruler, or measure from the top of the Parkerizing Tank to the top of the Parkerizing Solution. Write down this measurement as a reference, so this depth of Parkerizing Solution can be maintained. At this stage, the Parkerizing Solution in the Parkerizing Tank is a transparent, light green.

Directions For Mixing Replenish Solution

At this stage, mix up another gallon of Zinc Parkerizing Solution (4 oz. concentrate to 124 oz. cold water) and set aside in a plastic jug. This will be used to replace Parkerizing Solution lost in decanting (see General Maintenance).

4) Age the Parkerizing Solution. Note: This step is done one-time only. Iron is added to the Parkerizing Solution only on initial mix-up to age and condition the Parkerizing Solution, otherwise the first items processed will have a thin coating and will not retard wear very well. Aging and conditioning is done to prepare the Parkerizing Solution to do its work, and is not done again, until the entire Parkerizing Tank of Parkerizing Solution is replaced.

While maintaining the Parkerizing Solution at 140° F. (minimum 120° F., maximum 160° F.) add .32 oz. (by weight) of powdered iron (remember, .32 oz. of powdered iron *per each* gallon of Parkerizing Solution). If you have a powder scale, .32 oz. is exactly 140 grains. If you are using measuring spoons, .32 oz. is approximately ⅔ teaspoon. The best way to add the iron is to place it in a common coffee filter (like Mr. Coffee), with the sides drawn up and tied together with black iron wire at the top, forming a bag, and suspend it in the Parkerizing Solution, there will be only a slight visible reaction at this point, with only minimal bubbling on the surface of the bag. Hold the Parkerizing Solution in this temperature range (120° F. to 160° F.) for one hour, swishing the bag back and forth the length of the Parkerizing Tank every 4 to 5 minutes, followed by stirring with a chemically resistant plastic or stainless steel spoon.

After 30 minutes or so, light colored flakes will begin to form in the Parkerizing Solution. This is normal, a result of the chemical reaction between the Parkerizing Solution and the iron in the bag. Keep stirring and swishing for the entire hour. At the end of the hour, remove the bag from the Parkerizing Solution and depose of it.

NOTE: The powdered iron can be added without using the filter bag by just sprinkling it on top of the Parkerizing Solution, however, we do not recommend it, as it is difficult to keep the iron from sticking to the bottom of the Parkerizing Tank and causing a build-up of hard residue. This hard residue can be extremely difficult to remove, and can result in hot spots and possible eruptions.

Remember, any attempt to Parkerize without performing this aging step will result in a thin finish with poor durability. DO NOT ADD ADDITIONAL POWDERED IRON DURING THE LIFE OF A PARTICULAR BATH.

5) Heat to 185-190° F., add water lost in evaporation, (determined by measuring the level of Parkerizing Solution in your Parkerizing Tank, and bringing it back to the initial measurement), and stabilize at this temperature. Note: Properly mixed, the Parkerizing Solution will boil at approximately 210° F. Avoid boiling the Parkerizing Solution. Boiling causes the water to evaporate rapidly, requiring continual replenishment, generates an excessive amount of sludge buildup, and may also induce eruptions of the bath. There is nothing to be gained in heating the Parkerizing Solution beyond 190° F.

OPERATING INSTRUCTIONS

1) DISASSEMBLE THE GUN COMPLETELY - Parts such as pinned and soldered-on steel sight bases should be left in place. Parkerizing will lightly etch brass parts, leaving them somewhat frosty. If at all possible, it is recommended that brass parts be removed before Parkerizing. Parkerizing will severely damage aluminum parts - they MUST be removed. Check grip frames, triggerguards, sights and scope bases with a magnet to make certain they are not aluminum.

2) SCRUB ALL PARTS THOROUGHLY - Use a strong solvent such as TCE Cleaner Degreaser or acetone to remove all traces of lubricants and preservatives. It is extremely important to get the parts absolutely clean, so when/if the parts are bead or sand blasted, any dirt left on the surface does not get literally "pounded" into the surface of the steel, affecting the quality of the resulting Parkerized finish.

3) PREPARATION OF SURFACE -

a. **Polish**. This step is optional. Light pitting usually disappears during the blast operation, but large pits should be buffed out for a professional appearance.

b. **Blast the parts,** using clean media, to the surface finish desired. A coarser, rougher surface results in thicker, denser Parkerized finish. Brownells recommends using either #60-100 Glass Beads, silica sand, 120 grit silicon carbide abrasive compound, or fine, aluminum oxide, blasting grit. Another means to the rough finish is to use a Scott Murray Wheel with a 60 grit belt. Closely fitted areas like bolt locking lugs can be masked off using black plastic electrician's tape. As was mentioned before, non-blasted areas will Parkerize, but the coating will be thinner, and less coarse. If parts are not going to be Parkerized immediately, spray parts with Hold to keep them from rusting.

4) HANG THE PARTS - Make hangers for the parts using common black iron wire. Be sure to make the loop you hang the part on an oversized "O" shape instead of a narrow "U" shape to prevent discoloration streaks on the finished part. If at all possible, run the wire through screw or pin holes to keep the wire away from the visible, outside surface of the parts.

5) SUSPEND PARTS IN FRESH 909 CLEANING SOLUTION - Immersion time of 10 to 15 minutes. Scrub parts vigorously with a Brownells Rinse Tank Brush to remove all traces of blast media dust, Hold, and any remaining residue.

6) RINSE CLEANED PARTS - Submerging parts in Flowing Water Rinse Tank or under strong spray nozzle for 30 seconds to 1 minute (do not exceed 1 minute). Use another Brownells Rinse Tank brush and thoroughly scrub all nooks and recesses to remove all traces of the Hot Cleaning Solution. This is very important because if alkaline cleaning solutions are carried over into the Parkerizing Tank they will contaminate it, interfering with proper coating formation and producing excess sludge.

7) SUSPEND PARTS IN THE HOT WATER RINSE TANK - Parts should remain in the Tank for approximately 3 to 5 minutes. This step assures that residual cleaning material is totally removed, and it warms the part so the operating temperature of the Parkerizing Solution is not drastically lowered when parts are placed into it.

8) SUSPEND PARTS IN THE PARKERIZING SOLUTION - Important: Move parts directly into the Parkerizing Solution Tank from the Hot Water Rinse. You must move quickly because the parts are hot and dry and any delay may cause rust to form on the part. Parkerizing action will not take place on rusted areas. Make sure the parts do not rest on the bottom of the tank or come in contact with other items in the tank. The Brownells Parkerizing process is very fast; if you are only doing one or two guns at a time and are using a canning pot or similar tank, we recommend that you only process one part, or set of parts, at a time. A number of small parts can be processed in baskets made of stainless steel screen. (Note: Do not use black iron screen.) The Parkerizing action will begin immediately, and is indicated by considerable gassing. The parts begin to bubble and fizz, kind of like Alka-Seltzer in water. This is normal, and will slowly decrease during the short Parkerizing cycle. When the gassing ceases, the coating is complete, and the part should be removed.

When the Parkerizing process begins, you will notice the immediate formation of a light colored, insoluble residue, or sludge, which accumulates on the bottom of the Parkerizing Tank and swirls around within the bath. DO NOT PANIC. This is absolutely normal, and is formed as a by-product of the chemical reaction. It means the phosphate is being deposited on the surface of the metal. As long as the bath is stirred to keep it from settling, and the accumulation is not excessive, it will do no harm. Excessive sludge will settle on the parts in process and may cause "dusty" coatings on the finished parts and, in extreme cases, cause poor coverage. Normal maintenance requires this sludge must be removed on a regular basis. See General Maintenance. Complete Parkerizing time is indicated by the cessation of gassing, usually no more than four or five minutes, and sometimes much less. Should cessation not occur within 15 minutes, excessive etching of the metal surface is likely to take place. If the part is still gassing after 5 minutes, lift it out and inspect it. If the coating is satisfactory, remove the part and go to the next step, the Flowing Water Rinse. UNDER NO CIRCUMSTANCES LEAVE A GASSING PART IN THE PARKERIZING SOLUTION FOR LONGER THAN 15 MINUTES. Excessive etching may occur. Leaving the part in the Parkerizing Solution beyond the point of gas cessation usually does no harm but leaves the parts susceptible to a heavy buildup of the insoluble residue. Time in the Parkerizing Solution (gassing period) is a function of the alloy and hardness of the steel and the strength of the Parkerizing Solution. Density of the coating is determined by the type of alloy, its

hardness, and the preparation of the surface of the metal.

Because the working time in the Parkerizing Solution is so short, it should not be necessary to add water to the Parkerizing Solution while parts are in the Parkerizing Tank. The depth of the solution should be checked before the next part or set of parts is put in. Water should be added, to top off the Parkerizing Solution, and the temperature allowed to stabilize between 190° F. and 195° F., before more parts are suspended in the Parkerizing Tank.

9) PLACE THE PARTS IN THE FLOWING WATER RINSE TANK - The rinse should be done as soon as possible after removing the parts from the Parkerizing Solution Tank, and parts should be scrubbed to remove any surface accumulation of sludge. Also, any excessive buildup of the Parkerizing finish tends to set up on hot metal, making it difficult to rinse off. Time in tank should be as needed to completely clean the parts.

10) SUSPEND PARTS IN POST TREATMENT SOLUTION - Do this step only if you are completing the process at this time. **If you are going to further apply a spray-on or bake-on finish*** on top of the Parkerizing, DO NOT do this step. If you *are* going to do this step, leave the parts in the Post Treatment Solution for 5 to 10 minutes. Lift parts out of the Post Treatment Solution Tank and allow excess Post Treatment Solution to drip back into the Post Treatment Solution Tank. The post treatment has no effect on the wear resistance of the Parkerized finish but does substantially improve the corrosion resistance. Its use is recommended in all cases where corrosion resistance is important; where it is not, it may be omitted. **DO NOT HEAT** the Post Treatment Solution. ***Note:** If the next step in your secondary finishing process is a spray-on/bake-on finish like Brownells Baking Lacquer, then do not suspend in the Post Treatment Solution. The PTS will interfere with proper adhesion of the Baking Lacquer. Go immediately to the secondary application.

11) INSPECT, LUBRICATE, AND REASSEMBLE

FINAL OPTIONS

As mentioned before, fresh-out-of-the-tank Parkerizing is a medium, to dark, gray. Different alloys and different heat treatments will result in a variety of shades of gray, even on the same gun. Older guns that were Parkerized years ago often acquire a green/brown cast that is admired and appreciated by collectors and shooters. This green/brown cast is also greatly misunderstood by the same collectors and shooters. The color of the finish is a function of most everything that has come in contact with it over the years, including lubricants, preservatives, cleaners, stock finishes, and plain old dirt. By treating the coating with any number of lubes or preservatives, the color of new Parkerizing can be controlled and varied. Cosmoline and Rig add a greenish-brown tint to Parkerizing. Some folks add products like Acraglas dye, either brown or black, to Cosmoline or Rig Grease and then apply it to freshly Parkerized guns to give it an aged look. Brownells Ultra LTS, which is a black product, will do the same. An application of Brownells Oxpho-Blue™ between the cold water rinse and the hot water rinse results in greenish/brown color. Results are limited only by the imagination, and we are still experimenting. Please let us know what you discover so we can pass that information along in future revisions of these instructions.

PARKERIZING LONG GUNS WITHOUT A STAINLESS STEEL TANK

If you do mostly handguns or other small parts, it may be the most economical for you to do the bulk of your Parkerizing work in an enamel canning pot over a ring burner. To do an occasional long gun with this setup, the following instructions will apply.

The basic procedure is to suspend the cleaned, rinsed, and warmed long parts in a plastic or fiberglass tank that is long enough to hold the complete part level, just barely off the bottom. Then, carefully pour the heated Parkerizing Solution into the container, covering the parts. Try not to pour the Parkerizing Solution into the container, covering the parts, as that may cause some color variation. Pour the Parkerizing Solution past the barrel, allowing the parts to be covered from the bottom up. Wear hand and eye protection. Observe the gassing, and when complete, remove the parts and continue processing as previously described. Larger, more massive parts hold their heat longer and will continue to gas longer than smaller, lighter parts.

You must plan accordingly and save the long parts for last. Obviously, only one barrel, barreled action, or other long part can be processed in one cycle using this technique. The Parkerizing Solution will cool down too much to do a second part, so it must be returned to the original Parkerizing Tank to be reheated. Extreme care must be taken when transferring the Parkerizing Solution back to the Parkerizing Tank. The Parkerizing Solution should be allowed to cool, and transferred by carefully dipping. Do not attempt to pick up a long, narrow container and empty it into another vessel. The pour rate is very difficult to control, resulting in spilling and splashing, and the container may buckle, resulting in the loss of both the Parkerizing Solution and the container.

STORAGE

The Parkerizing Solution can be left in the Parkerizing Tank between uses as long as it is covered to keep out dirt, bugs, and other contaminants. Freezing does not damage the Parkerizing Solution, but do not attempt to heat frozen Parkerizing Solution without first allowing it to thaw at room temperature. The Parkerizing Solution can also be stored in plastic jugs or buckets after decanting. (See General Maintenance.)

GENERAL MAINTENANCE

SLUDGE REMOVAL: In normal operation of the Parkerizing process, an insoluble residue, or sludge, is formed. This sludge clouds up the Parkerizing Solution and, if allowed to remain, can cause thin or incomplete coating. It can also burn onto the Parkerizing Tank's bottom, causing hot spots, and making it quite difficult to remove. Brownells recommends that this sludge be removed after the first use of a newly mixed bath, especially when the iron used in the aging and conditioning phase is added directly into the Parkerizing Solution. We have found that there is significantly less sludge generated when the recommended coffee filter bag is utilized. If you use that system of getting the iron into your Parkerizing Solution during the aging process, you may use your discretion as to when the Parkerizing Solution should be decanted. As long as the sludge is neither interfering with proper coverage, nor building up hard deposits on the bottom or sides of the Parkerizing Tank, then it may not be necessary to remove it.

One easy method of sludge removal is to decant the Parkerizing Solution. This is the same technique used by wine makers to separate the clear wine from the dead yeast and other byproducts of fermentation. First, allow the Parkerizing Solution to cool down to room temperature, then add water to return it to the proper operating level. After cooling, the sludge will settle to the bottom of the Parkerizing Tank, allowing the clear Parkerizing Solution to be drawn off using a siphon hose made from surgical tubing. Cut a length of surgical tubing long enough to reach from the inside bottom of the Parkerizing Tank to a plastic bucket or other container sitting on the floor. Fill the section of tubing with water and pinch both ends closed with your fingers. Place one end under the surface of the Parkerizing Solution and the other in the bucket. Release both at the same time, and the Parkerizing Solution will siphon into the bucket. Keep the upper end of the tubing under the surface of the Parkerizing Solution until the level is drawn down to the settled-out sludge. Withdraw the hose and stop the siphoning when the surface of the Parkerizing Solution reaches the sludge. Use a spring clip to hold the hose in place so you don't have to stand over it during the decanting process. Remove the sludge that is left from the Parkerizing Tank and dispose of it. If any hard deposits remain on the bottom or sides of the Parkerizing Tank, remove them with scratch pads, scrapers, or by sand blasting.

The Parkerizing Solution can be returned to the Parkerizing Tank immediately or it can be left stored in the plastic containers. When the Parkerizing Solution is returned to the Parkerizing Tank, before it is used, it must first be heated to 120° F. - 160° F., and then adjusted to operating level by adding Replenishment Parkerizing Solution. It is important to remember that bringing the Parkerizing Solution to operating level by adding water prior to decanting re-establishes the correct concentration of the mix. When the Parkerizing Solution is decanted, some of it is left behind with the sludge and cannot be salvaged; adding pre-mixed Replenishment Solution to bring the Parkerizing Tank to operating level will bring it back to the starting point. The pre-mixed Replenishment Parkerizing Solution formula is the same as the original Parkerizing Solution used to start the Parkerizing Tank. The proper ratio mix for one gallon is 14 oz. Parkerizing chemical combined with 114 oz. of water. Do not add any more powdered iron.

INSTRUCTIONS FOR ZINC PARKERIZING PRE-DIP BLACKENER

For those who desire a parkerized finish that is truly black, Brownells offers a simple, easy-to-use, and inexpensive immersion process step

that is incorporated into the Zinc Parkerizing system just prior to the actual parkerizing bath. Parkerized parts finished using the Brownells ZPDB offer the same corrosion resistance and other advantages as parts finished with only Brownells Zinc Parkerizing.

Brownells ZPDB was developed for use specifically with Brownells Zinc Parkerizing process. While we have experienced some success using ZPDB during the Brownells Manganese Parkerizing process, the results are not predictable and may not meet your expectations. Brownells recommends that the ZPDB be utilized only with Brownells Zinc Parkerizing.

NECESSARY EQUIPMENT:

1) You will need a tank large enough to be able to completely immerse the components to be finished.

The requirements for the bath tank are that it be made of a non-reactive material. Acceptable materials include fiberglass, PVC, rubber-lined steel, and glass. Do not use stainless steel. Common plastic "paint" buckets, wastebaskets, and the like are good potential tanks.

2) Wire to suspend the components in the ZPDB bath. In most cases, the same suspension system that was established at the beginning of the Parkerizing process will be adequate for the ZPDB bath. Ordinary black-iron wire is recommended. Do not use copper or aluminum.
3) A non-reactive spoon or similar mixing device.
4) Suitable measuring devices made of glass or plastic.
5) Safety equipment.

Due to the acid content of the bath, it is recommended that efforts be made to protect hands, eyes, and skin. Protective gloves, face guard, and rubber apron should be worn when mixing or handling ZPDB, and also during the rest of the Parkerizing process.

Brownells ZPDB is offered as a concentrate, requiring only the addition of hydrochloric acid and water to make up the bath. To make up a gallon of Brownells ZPDB solution, the ingredients are 1 oz. ZPDB, 19 oz. HCL, and 108 oz. of clean water.

To mix one gallon of solution:

1) Carefully measure 108 oz. of clean, warm (80-100° F.) water and pour into the non-reactive tank.
2) Measure and add 19 oz. of hydrochloric acid to the water in the tank. Mix until solution is clear, using a non-reactive spoon or similar device. (Remember, always add acid to water, never the other way around.)
3) Measure and add 1 oz. of Brownells ZPDB to the tank. Mix thoroughly with non-reactive spoon.

The bath works well at "room temperature", but the ideal operating temperature is 80-110° F. The typical active Parkerizing/bluing room usually falls within that range during operation. Applying heat is not usually necessary unless the ambient temperature falls below 65° F. If possible, it is better to heat the room rather than the bath.

To use Brownells ZPDB:

The blackening step is performed during and within the normal process sequence of Zinc Parkerizing, with one exception. The hot water rinse (Step 4 in the Step-By-Step Operating Procedure) is eliminated, and the Brownells ZPDB immersion is substituted. It is performed immediately after the cold water rinse, (Step 3 in the Step-By-Step Operating Procedure), and just before the suspension in the Parkerizing solution (Step 5 in the Step-By-Step Operating Procedures).

The cleaned and rinsed parts, still suspended by wires, are immersed in the ZPDB bath for a very short period of time, typically no more than 5-15 seconds. The reaction that takes place is very definite and obvious, and nothing is gained in leaving the parts in the solution any longer than it takes. In fact, the components do not have to be totally black, just dark gray. Leaving the parts immersed beyond the black stage may result in a coating so thick that it cannot support itself, causing it to slough off. When the components have darkened, lift them out of the bath by their wires, and hold for a short period of time above the bath, allowing the excess solution to drain back. Do not handle the parts, as it will disturb the fragile coating, causing irregularities in the final finish. Move then to the parkerizing bath and continue the process. Used with the Brownells Zinc Parkerizing process, the finished surface will be dead black, but will retain the large crystal "sparkle" common to the Zinc Parkerized finish.

Storage of the bath requires the container to be well sealed. Either pour off the bath into plastic jugs with sealable caps, or into a plastic bucket with a sealable lid. If your available container cannot be sealed, at a minimum, stretch a clinging plastic wrap product over the top to seal out dirt and other contamination, and also to prevent the evaporation of the bath. Stir thoroughly before using again.

TROUBLE SHOOTING

MALFUNCTION

MOTTLED, LIGHT AND DARK COLOR VARIATIONS

PROBABLE CAUSE:

1) Variations in surface hardness due to:
   a) spot hardening,
   b) case hardening,
   c) metallurgical variations,
   d) spot annealing,
   e) welded areas.

REMEDY:

1) Considered normal for some firearms, such as Colt Government Models and some clones, where the front of the slide and the area around the slide stop notch are spot hardened and will color darker than the rest of the gun. Investment cast parts with a high silicon content, such as Tanfoglio EAA/P9 slides and some 1911 clone slides, usually turn out with a thin, mottled coat and a brownish cast. There is no real cure to the problem but you can apply baking lacquer or hot blue over the Parkerizing. To get an even color on case-hardened parts, such as single-shot shotgun and Mauser receivers, you will have to remove the hardened skin to get a uniform, clean surface. Or, you may be able to use an acid pickle to prepare the surface. This mottled color is only cosmetic, however, and does not affect the Parkerized finish's durability or usefulness. Frequently, if you apply an oil or grease to Parkerized surfaces, it often helps to eliminate or reduce the differences in color shades. Non-critical welded parts can be thoroughly annealed, which makes the steel uniform, and should help color uniformity.

PROBABLE CAUSE:

2) Texture patterns caused by blasting technique.

REMEDY:

2) Bead and sand blasting, like polishing on a wheel, requires a certain technique in order to avoid differences in the final color and texture. Areas that get missed in the blasting step of the process will be lighter in color, and have a thinner coating. Remnants of bluing or red rust will not Parkerize satisfactorily.

PROBABLE CAUSE:

3) Failure to remove oil, corrosion retardants, or cleaning products from the parts.

REMEDY:

3) Parts contaminated by oil, rust, corrosion retardants, and cleaning products will usually be characterized by light-colored, poorly-coated streaks, where the Parkerizing Solution simply could not reach the base metal. The rough texture of blasted parts requires extra effort to ensure that all such surface contaminants are removed. If the spots are noticed prior to the parts being placed in the Post Treatment Solution, or before they are treated in any way with lubricating or preservative products, they can be returned to the blaster and the finish evened out and then returned to the Parkerizing precess, without affecting the final Parkerizing finish.

PROBABLE CAUSE:

4) Excessive residue interfering with satisfactory coating.

REMEDY:

4) Decant by siphoning off clear Parkerizing Solution and disposing of sludge. (See General Maintenance.)

PROBABLE CAUSE:

5) Parkerizing Solution is contaminated.

REMEDY:

5) Replace Parkerizing Solution if contaminated. Review procedures to make sure that future contamination does not occur.

PROBABLE CAUSE:

6) Parts not left in Parkerizing Solution until gassing stops.

REMEDY:

6) Parts should be left in the Parkerizing Solution until gassing ceases. This usually occurs within five minutes. If the part is still gassing

after five minutes, remove it, rinse it thoroughly in clear water and examine. If the coating is satisfactory, continue processing.

PART DOES NOT FINISH AT ALL

PROBABLE CAUSE:
1) Part is stainless steel.

REMEDY:
1) Stainless steel cannot be Parkerized. Either leave it with its natural look, finish with Oxynate 84™, or coat with a Baking Lacquer.

PROBABLE CAUSE:
2) Parkerizing Solution is contaminated/depleted.

REMEDY:
2) Replace Parkerizing Solution with a freshly-mixed one, being sure to age with powdered iron and bring to operating level.

ROUGH, GRAINY SURFACE,

Usually on the upper surface of the part as it is suspended in the Parkerizing Solution.

PROBABLE CAUSE:
1) Natural occurrence, but is usually encountered on parts put into a newly mixed Parkerizing Solution. Sometimes caused by excessive time in the Parkerizing Solution. Seldom causes any harm.

REMEDY:
1) Don't allow parts to remain in the Parkerizing Solution any longer than necessary to get good coverage. Be sure to stir Parkerizing Solution during Parkerizing phase, which helps cure this problem. Scrubbing the parts with a brush in the cold water rinse following the Parkerizing step will usually remove or help smooth out this rough surface. It can also be removed with #000 or #0000 steel wool when rubbing down with grease or Cosmoline immediately after Post Treatment Solution coverage.

BROWN OR YELLOW DISCOLORATION

PROBABLE CAUSE:
1) Rust was allowed to form on the base metal because too much time was taken between the Flowing Water Rinse Tank and the Parkerizing Solution Tank.

REMEDY:
1) Reblast and reprocess. If rust is excessive, treat with Steel White or Rust and Blue Remover before blasting, so that blast media is not contaminated with rust. Rust contamination in abrasive medias can become embedded in blasted parts and cause finishing problems later on.

Parkerizing

STEP-BY-STEP OPERATING PROCEDURE

1

PREPARE PARTS WITH DESIRED FINISH and **Plug Bores** and **Gas Ports** in a safe manner.

2

SUSPEND PARTS IN FRESH 909 SOLUTION to remove all dirt, grease, oil and contaminants. **Operating Temperature: 180° F. Immersion time: 10-15 minutes.**

3

RINSE CLEAN PARTS in Flowing Water Rinse Tank. Scrub parts with soft brush to remove all traces of 909 Cleaning Solution. Work rapidly. **Immersion Time: Not to exceed 1 minute.**

4

SUSPEND PARTS IN HOT WATER RINSE TANK to thoroughly heat parts prior to Parkerizing. **Operating Temperature: Vigorously boil. Immersion Time: 3-5 minutes.**

5

SUSPEND HEATED PARTS IN PARKERIZING SOLUTION Operating Temperature: 190-195° F. Parts remain in solution until gassing stops. **Usual Time: 3-10 minutes. Do not exceed 15 minutes.** Check appearance of parts every 5 minutes.

6

RINSE PARKERIZED PARTS in Flowing Water Rinse Tank. Scrub parts thoroughly with a stiff brush to stop all Parkerizing action. Work rapidly. **Immersion Time: As needed to thoroughly clean parts.**

7

7a

SUSPEND PARTS IN POST TREATMENT SOLUTION to improve corrosion resistance. **Use full strength. Operating Temperature: Room Temperature; 68° F. to 90° F. recommended. Do Not Heat Oil. Immersion Time: 5-10 minutes.**

or

7b

IF A PAINTED on or spray-on/bake-on finish is desired, do not immerse in Post Treatment Solution. but go directly to the application of the selected finish. **Be sure parts are completely and totally dry before applying finish.**

8

8a

REASSEMBLE GUN. Remove parts from Post Treatment Solution Tank and hang on rack over tank to allow excess Solution to drain back into tank. Wipe off and reassemble.

or

8b

REASSEMBLE GUN after completing selected painted or spray/on/bake-on finish.