The Care and Preservation of

Historical Iron

By Clara Deck, Senior Conservator, The Henry Ford

Historical iron can be maintained for years of use and enjoyment provided that some basic care and attention is given to its preservation. The conservation staff at the The Henry Ford have compiled the information in this fact sheet to help individuals care for their objects and collections. The first step in the care of collections is to understand and minimize or eliminate conditions that can cause damage. The second step is to follow basic guidelines for care, handling and cleaning.

NOTE: This Fact Sheet will present a brief overview of the care of iron objects, stressing good storage as the best method of preservation. It does not address the serious problems of preserving archaeological metals excavated from land or marine sites. People who collect unconserved archaeological artifacts should be aware that those types of objects are rarely stable if left untreated.

IDENTIFYING IRON ARTIFACTS

Iron is a very common metal in historical collections. It is found in a variety of alloys, known as "ferrous metals", comprising wrought iron, cast iron and steel. Galvanized or tin-plated sheet is also a familiar material in historical collections. Ferrous metals are magnetic so the presence of iron can, therefore, be easily identified with the use of a magnet.

CAUSES OF DAMAGE

Corrosion, poor handling and inappropriate storage are the major causes of damage to iron artifacts. By far the most widely seen problem associated with metal artifacts is corrosion. Active corrosion causes a continuous loss of metal from the object. Mishandling, however, can result in breakage, bending or cracking. Cast iron is usually a relatively brittle material and will not bend as one might expect metals to do. Salts, oils and moisture can lead to metal corrosion, so if you handle metal artifacts with bare hands you risk damaging them.

CORROSION

Uncoated ferrous artifacts that have been kept clean and dry will usually develop stable surfaces. Stable surfaces may appear blue-black to brown, and are not scaling, flaking or pitting. This kind of compact rust that does not progress may actually protect the object if it is left intact. Hand-forged tools, for instance, often retain a dark, rough finish. Not all

iron or steel was polished, and altering original surfaces may reduce the historical value of an object. Dark, stable surfaces may be considered "patinas". Collectors should be aware of any special finishes (i.e. tempering or bluing on firearms) that may determine the correct color the metal should be and the degree to which it should be cleaned.

As mentioned above, orange rusty iron is often seen but may not be cause for alarm if the corrosion layer is continuous, relatively even and does not flake off easily. If you notice ongoing rusting and changes to the surface appearance, including paint loss, chances are the iron is actively corroding. Problem corrosion in iron artifacts usually becomes apparent as pits develop at active corrosion sites. This active corrosion is of concern, especially if it develops at joints between metal parts. Bright orange droplets or "sweating" forming on the metal surface indicates advanced active corrosion induced by high atmospheric humidity (above 70%) and the presence of salts. Dust and grime left to accumulate on metal artifacts will actually hold moisture to the surface and may induce corrosion even where the humidity is not that high.

Painted metal artifacts can usually withstand corrosion as long as the coating is not broken. Where there are paint losses, corrosion will progress rapidly (as we notice on cars). If left untreated, and in a poor storage environment, the corrosion in this case will continue and eventually cause more severe paint losses.

CARING FOR IRON ARTIFACTS

Since iron artifacts are so varied, it is not possible to cover all aspects of treatment in this document. Your first line of defense will be good storage.

HANDLING

Most metal artifacts should not be handled with bare hands. Salts and oils from your skin can etch into uncoated metals and may even cause permanent damage. Handle your valuable collection with gloves. Soft cotton gloves, or any clean glove or rag may be employed for this purpose. Lift objects from their center of gravity, and avoid lifting objects by limbs, handles, spouts or other extended areas; the metal may have developed unseen weakness' over time and could break if stressed further.

STORAGE

A simple way to preserve iron is to store it properly. Maintain an even, low humidity where metal objects are kept, ideally below 55 % Relative Humidity (RH). Rapidly fluctuating temperatures will cause coatings to fail as the metal expands and contracts; this problem is most acute in the case of artifacts composed of sheet metal. In most

homes, an even environment is difficult to ensure but, generally speaking, basements in our area are damp in the summer and therefore should not be used for the storage of metal artifacts. Humidity sensors are available through suppliers listed on attached sheet for those who wish to check conditions near their collections. Do not allow dust to accumulate on stored objects. You can protect your collection by storing it on shelves padded with inert foam (i.e. "Ethafoam"). You may choose to drape plastic or cloth curtains around storage shelves, but do not place iron artifacts in sealed plastic bags - the danger of moisture condensation on the metal outweighs the benefit of dust protection.

CLEANING AND CARE

If you choose to attempt cleaning your iron artifacts, and you are sure of the surface appearance you wish to achieve, some of the following suggestions may help:

Cleaning - Stable or painted surfaces should be kept dust free. Vacuum clean all stable artifacts regularly, using the nozzle attachment with a brush. A bristle brush may help to raise dust from crevices. Any wet cleaning should employ deionized or distilled water only to avoid contaminating the metal with salts or other impurities.

Degreasing - The presence of degraded oils and grime may promote corrosion. You can degrease most uncoated metal artifacts with mineral spirits. (Please consult the manufacturer or Material Safety Data Sheet for complete safety requirements.) Wipe it over the surface in a small, inconspicuous area first to test for discoloration. After the solvent has evaporated, check for any undesirable effects (usually caused by residual dust or an old finish). Continue the cleaning process, using mineral spirits-dampened cloths to lift the grime. You may find that sharpened bamboo skewers, nylon bristle "parts brushes", craft stencil brushes or even tooth brushes help you to get into crevices and joint areas.

If straight mineral spirits does not seem to be raising the grime, a conservation-recommended surfactant, "Vulpex", may be used in a 1% solution in mineral spirits. Be very certain to rinse with clean mineral spirits to remove residual detergent.

Corrosion Removal - On objects such as cast iron stoves and rusty machinery, it is sometimes possible to remove encrustations of corrosion products by rubbing with steel wool pads or nylon "synthetic steel wool" pads and a light lubricating

oil, or mineral spirits. Always start with the least aggressive method and work your way up. Large sewing needles, scalpels or X-Acto knives can also be used to chip up or lift encrustations. Heavily corroded objects, original painted iron artifacts or those damaged by salts may require the assistance of a trained conservator.

Corrosion Inhibition of Bare Metal - If you are reasonably sure that there are no salt residues on your artifacts and you are able to remove the worst of the rust encrustations, it is possible to protect the surface with a variety of corrosion inhibitors. The simplest inhibitors are machine oils which inhibit rust by displacing water and moisture. Oils and greasy coatings may hold dust and grime to surfaces, so use sparingly, and check often. It also should be understood that most "inhibitors" will darken the surface of the artifact, and, therefore, are not appropriate for all cases. Bright surfaces on machines and other objects that cannot be stored indoors may benefit from the application of a thick, waxy corrosion inhibiting oil such as "SP-400", made by CRC, or similar brush-on or spray-on products.

"Rust converters" are another kind of commercial product designed to work on rusty metal by converting unstable corrosion into a stable, protective layer with the help of a latex-based coating. Some conservators are now recommending the following when a relatively even, lightly corroded surface will be preserved as-is: "Rust-Oleum Rust Convert", and "Extend".

Polishing - If you wish to return a steel object to its original, polished appearance, it is usually possible with a fair amount of elbow grease and a good polishing compound. We recommend "Solvol Autosol" for general purpose polishing. Test for the degree of polish you wish to achieve on a small inconspicuous part of the object. Buff on the polish with a clean rag or very fine steel wool for added abrasiveness. The surface must be rinsed with mineral spirits after polishing to remove any polish residues.

COATING

Choosing the appropriate surface finish is an important step in the preservation of iron artifacts because iron is a very reactive metal and usually needs the added protection of a coating, especially if it has no natural protective layer. The inhibitors and converters mentioned above may be considered as coatings. Sometimes traditional coatings are

recommended, such as "Stove Black" for historical cast iron stoves. All surfaces must be carefully cleaned before any coating is applied.

Lacquering - Polishing exposes fresh, reactive metal to the atmosphere and, therefore, to further corrosion. In rare cases, it may be appropriate to lacquer iron or steel. Since lacquering requires the use of volatile solvents and spraying equipment, we recommend that this type of work be left to accomplished restoration professionals. No coating is impervious to moisture, and badly applied lacquer or paint can lead to worse corrosion.

Painting - It is rarely appropriate to repaint an original artifact. Museums and collectors recognize the value of preserving as many original surfaces as possible, even on old tools and machines. Original paint can tell a great deal about the use of objects and may retain decorative detailing under darkened varnish layers. Conservators can reveal and restore original paint in many cases.

Some objects that were originally painted may have lost the majority of their finish (i.e.. a large outdoor machine). In cases like these, painting may be an appropriate method of preservation. Before preparing the metal for repainting, the first thing to do is to check in crevices, behind handles, maker's plates or doors for bits of the original paint. With even a small sample, and a good eye, you may be able to match new paint to the authentic color. If you choose to repaint and you have researched appropriate paint schemes, consider the additional benefits of "rust converters" explained above. If you do not use a product such as this, you will need to completely strip and solvent-clean your artifact to ensure any degree of paint adhesion. In either case, it is best to use primers and paint specifically formulated for use on metals (sometimes called "Rust Paints").

Waxing - For most collectible iron artifacts, the best coating we can generally recommend is wax. Wax provides a relatively flexible coating that is easily applied and that can be renewed. In most cases, The Henry Ford uses "Renaissance Wax", or other "microcrystalline" waxes because it is inert and will not yellow over time. It is simply applied with a clean cloth and buffed out with a rag or bristle brush (shoe polish brushes are great for this purpose). Again, wax is not an appropriate coating for all metal surfaces, especially where it is impossible to cover the whole object, or where the slightly glossy finish would be inappropriate.

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London, SW10 OUH, 1984

The Thames and Hudson Manual of Metalworking
Peter Scott
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London, 1978

The Care of Antiquities and Historical Collections
A. Bruce MacLeish
American Association of State and Local History
AASLH Press
Nashville, TN, 1972

CCI Notes
Canadian Conservation Institute
Note 9/5
1030 Innes Road
Ottawa, Ontario, Canada

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Plenderleith, H.J., & Werner. A.E.A.
Oxford University Press, London
2nd Edition, 1971

Corrosion and Metal Artifacts
Brown, Burnett, Chase, Eds.
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Washington, D.C.
NBS Special Publication 479, 1977.

IRON CARE SUPPLIERS

Mineral Spirits, Lubricating Oils, Steel Wool, Nylon Scrub Pads, Corrosion Inhibiting Coatings, Rust Converters:

Hardware Stores

Auto Parts Stores

Industrial Supply Companies (large orders only-i.e.: Grainger TANNIC ACID, plus ingredients for preparing)

Chemical Supply companies, such as:
Aldrich Chemicals
940 W. St. Paul Ave.
Milwaukee, WI 53233
800-558-9160

Brushes, X-Acto Knives:
Arts/Crafts supply stores

Waxes, Vulpex Soap:
Conservation Resources International L.L.C.
8000-H Forbes Place
Springfield, VA 22151
800-634-6932
Fax: 703-321-0629
TALAS
568 Broadway
New York, NY 10012
(212) 219-0770

Polishes, "Solvol Autosol":
Good Hardware stores

Jewelry or Specialty Gift stores, such as:
C.R. Hill
2734 W. 11 Mile Rd.
Berkley, MI 48072
248-543-1555

Brit USA Imports
1378 Roslyn
Grosse Point, MI 48236

810-783-2271

Humidity Indicators:
University Products
517 Main Street
PO Box 101
Holyoke, MA
800-762-1165

"Ethafoam", Poly-ethylene Foam:
Great Lakes Packaging Supply
10650 N. End Ave.
Ferndale, MI 48220
248-548-1116

REFERENCES
For a listing of conservators in your area, please contact:

The American Institute for Conservation of Historic & Artistic Works
1717 K Street NW
Suite 301
Washington, DC 20006
202-452-9545
http://aic.stanford.edu/guide/form.html

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Note: The in-house conservation staff at The Henry Ford has developed these Preservation Fact Sheets to assist in caring for your historical materials. These fact sheets provide basic information on the care, cleaning, and handling of a particular type of artifact, referral information to other conservation organizations, and a bibliography of authoritative works. Individuals may also arrange for a private consultation with a conservator. For more information, please contact the Benson Ford Research Center at research.center@thehenryford.com.

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