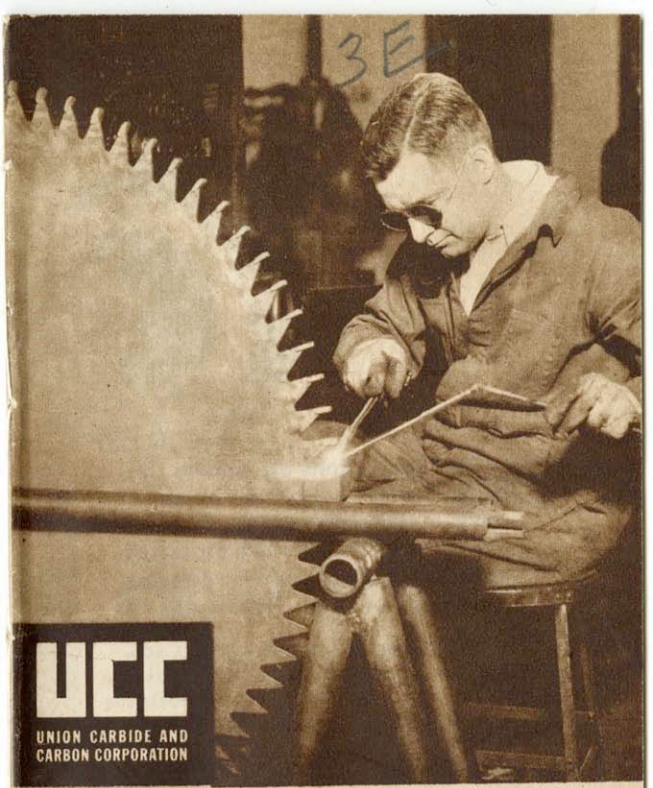


UCC

UNION CARBIDE AND CARBON CORPORATION

HAYNES STELLITE PRODUCTS

The illustrations throughout this booklet show a few of the thousands of wearing surfaces that last 3 to 25 times longer when protected against abrasion with hard-facing materials.

Hard-facing cement pump ring with Haynes Stellite

UCC

HAYNES STELLITE PRODUCTS

The Haynes Stellite Company, which is a unit of Union Carbide and Carbon Corporation, manufactures three classes of products for making metal last longer. These are:

I. Haynes Stellite, Hascrome and Haystellite wear-resisting alloys.

II. J-Metal Haynes Stellite cutting tools.

III. Hastelloy corrosion-resisting alloys.

I. The Wear-Resisting Alloys

When two objects are rubbed against each other, heat is produced. The Indians knew this and were able to make a fire by spinning one piece of wood against another.

This heat that is caused by friction is a great enemy of metal tools and machines. With the aid of delicate instruments, scientists have discovered that even moderate friction makes a tiny section along the edge of a piece of steel become red hot.

Steam valves last longer when hard-faced

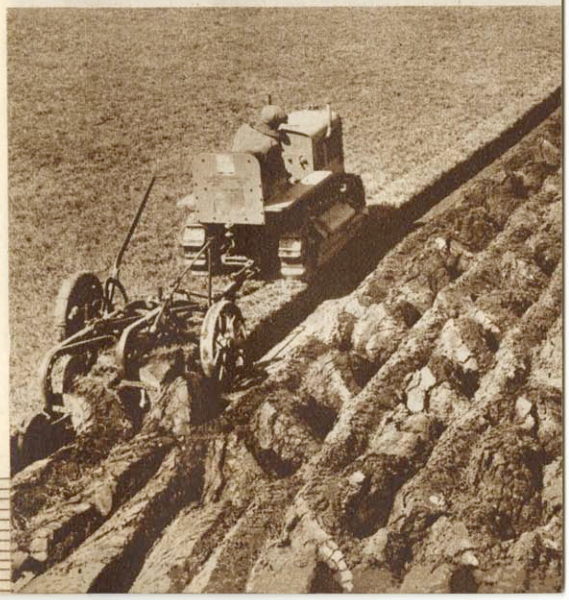
This red-hot section is much too small for the naked eye to see; but it is not too small to do damage to the metal, for what actually happens is this:

The tiny red-hot section becomes softer than the rest of the metal—just as the red-hot end of a wire held in a flame becomes soft.

Heat Causes Wear

Because this section is soft, whatever it is rubbing against—metal, rock, or earth—wears it down. If this constant heating up and wearing down continues, the piece soon becomes useless.

Haynes Stellited plowshares mean greater acreage



For years, users of steel and iron put up with this wear because they knew of no way to prevent it. But as machines became more expensive, the importance of preventing wear became more important.

The first step in this battle against wear was to use harder steels. These afforded some improvement, but friction still wore them down. Noticing this, engineers said, "If we could only protect our steel and iron with some metal that would not get soft at red heat, our problem would be solved."

This—a metal that friction would not make soft at red heat—seemed to be an impossible demand. The hardest steels then known were given their hardness by heating them red hot and then suddenly cooling them. Clearly, if these steels were again heated red hot (as they would be by friction) they would lose their hardness. Knowing this, the engineers knew that they must find some material that was *naturally* hard and not dependent upon heating and cooling for its hardness.

Haynes Stelliting protects cement screw conveyors from wear

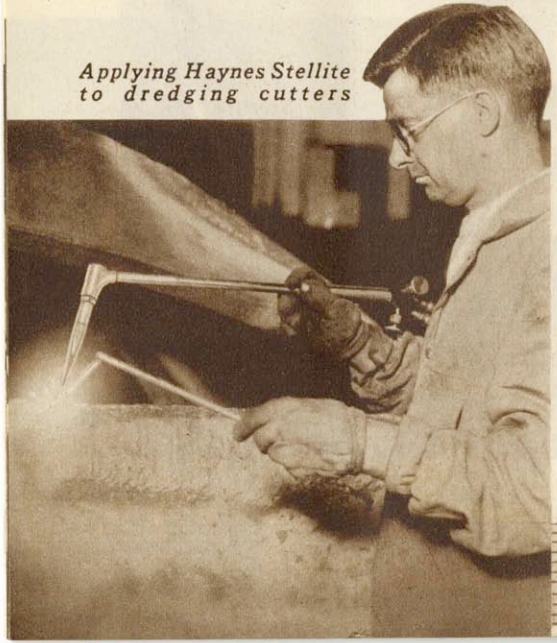
Hard-facing multiplies the life of automotive valves

The Ideal Material

This was a big order, but luckily it was easy to fill. Luckily, because just such a naturally hard material had been known to cutting-tool makers all during the war years.

This material was Haynes Stellite. Years before, Elwood Haynes—the inventor of the first automobile—had been experimenting to find some metal that would not rust or tarnish. He hoped to use such a stainless material for cutlery and tableware. His method was to mix various little-known metals in different proportions.

Applying Haynes Stellite to dredging cutters



Hard Though Red Hot

After many unsuccessful attempts, Haynes hit upon one combination of cobalt, chromium, and tungsten that seemed to be just what he was looking for. It had a bright clean finish. It contained no iron and therefore could not rust. Furthermore, he noted, it stayed practically as hard when it was red hot as it was when cold. This also was because it contained no iron.

In fact, this new material, "Haynes Stellite," seemed to be ideal—and Haynes Stellite became the first stainless metal ever produced, the father of all the stainless metals that are so familiar today.

Farmers earn greater profits with Haynes Stellited plow disks

Imagine his disappointment, then, when he tried to make a piece of cutlery out of Haynes Stellite and discovered that it was so hard that no ordinary steel tools could cut it!

Then he had another idea. For if Haynes Stellite was too hard for steel to cut, it ought to be ideal for cutting steel. He made some lathe tools and tested them. They performed excellently, cutting the hardest steel with ease. These tools were put on the market in 1913.

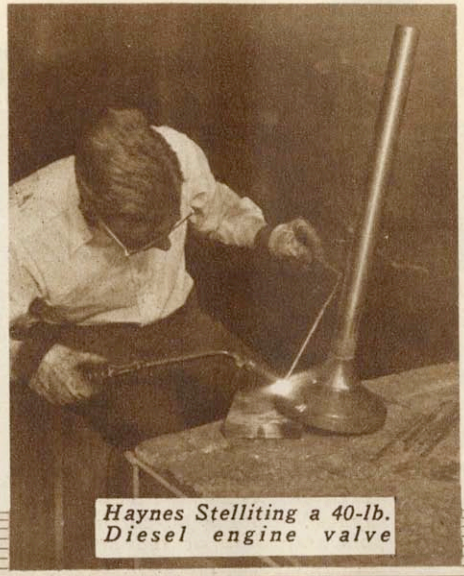
War Service

At the outbreak of the World War, the need for lathe tools that would not wear out and thus slow up production became acute. The new tools made of Haynes Stellite—the material that was too hard for steel to cut, that stayed hard even at red heat—were the obvious solution to this problem. They were tested and won instant welcome.

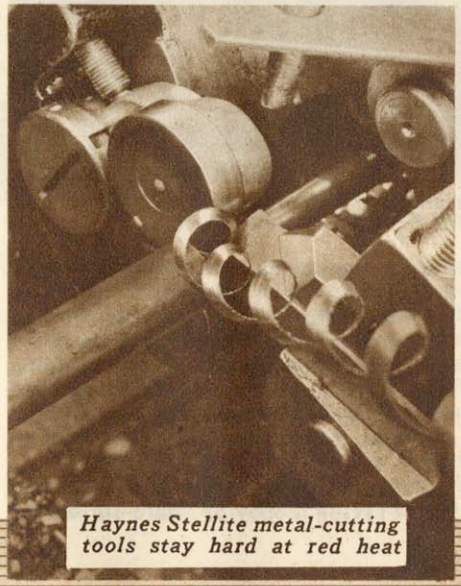
Haynes Stellite tools cut the new steel castings and forgings faster than steel tools could—and they lasted many times longer. In many plants, they doubled and tripled the output—this despite the fact that extra men and machines could not be had at any price. They began a new era in metal-cutting methods.

Haynes Stellite Welding Rod

This war-time service definitely estab-



Haynes Stelliting a 40-lb. Diesel engine valve



Haynes Stellite metal-cutting tools stay hard at red heat

lished the superiority of Haynes Stellite; and shortly after the war, the ideal process for applying it as a wear-resistant surfacing had also been perfected.

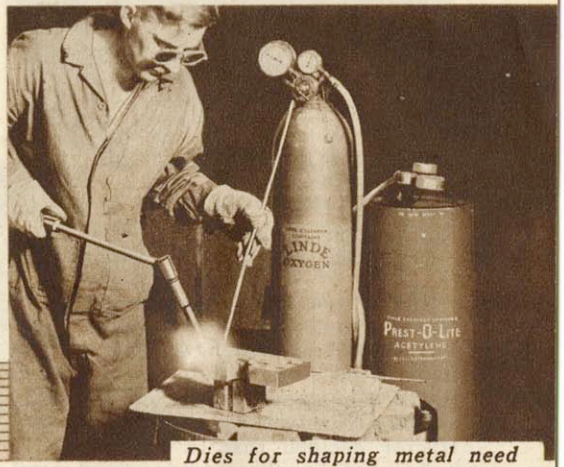
This process was oxy-acetylene welding, which made it possible to weld a thin, inexpensive layer of Haynes Stellite to the metal surfaces that needed protection. This method of applying Haynes Stellite was tried and was an instant success. Dissatisfied users of steel and iron, who had been demanding a hard, wear-resisting material, now had what they wanted—and had it in a form that was inexpensive and convenient to use.

Wear does not destroy Haynes Stellited cement plow arms

Today there is scarcely an industry that is not saving money by "hard-surfacing" or "hard-facing" tools and machine parts with Haynes Stellite.

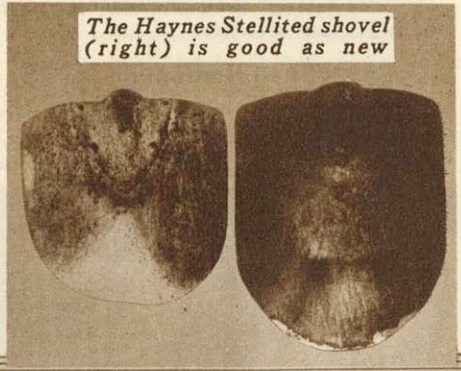
"Red Hardness"

Haynes Stellite's ability to stay hard at red heat is called its "red hardness," and this quality enables it to make metal parts last two to twenty-five times longer. Furthermore, when a surfacing of Haynes Stellite finally does wear off, the part can be Haynes Stellited again and again. In other words, the original metal part (which is usually called "the base metal") will last indefinitely if protected with Haynes Stellite.



Dies for shaping metal need Haynes Stellite's red hardness

A few examples of how Haynes Stellite increases the life of familiar metal objects will best illustrate its merits.



The Haynes Stellited shovel (right) is good as new

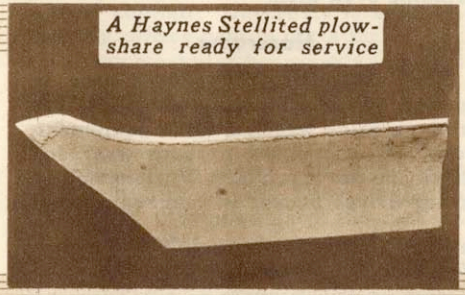
Shovels

The ordinary hand-shovel is one of man's oldest and most familiar tools. For centuries, men have been digging in earth and stone with them—and throwing them away when the metal edge wore away. A few years ago, however, a contractor decided that it was expensive and wasteful to throw away a good metal shovel just because a few inches at the edge were worn off. He heard about Haynes Stellite and had some applied to the edges of a few shovels. The Haynes Stellited shovels lasted so much longer that, today, scores of contractors save money by hard-facing shovels with Haynes Stellite.

Plowshares

Like shovels, plowshares have been used ever since man began to turn the earth. In ancient days, plowshares were made of wood. Later, various metals were used because they lasted longer. Today, plowshares are made of steel; yet even steel wears away too quickly—especially in sandy or rocky soil. Where there is much plowing to be done, replacing or redressing worn-out shares becomes very expensive. That is why progressive farmers are now among the most enthusiastic boosters of Haynes Stellite.

Farmers have found that by spending



A Haynes Stellited plowshare ready for service

a few dollars for a hard-facing of Haynes Stellite, they can make one share last indefinitely and stay in the ground much longer without redressing. For instance, a Louisiana farmer plowed 80 acres with a Haynes Stellited share. The same acreage used to require five ordinary shares.

An Iowa farmer Haynes Stellited his corn-planter runners because ordinary runners were worn useless after 400 acres. The Haynes Stellited runners

were hardly scratched after covering the same distance.

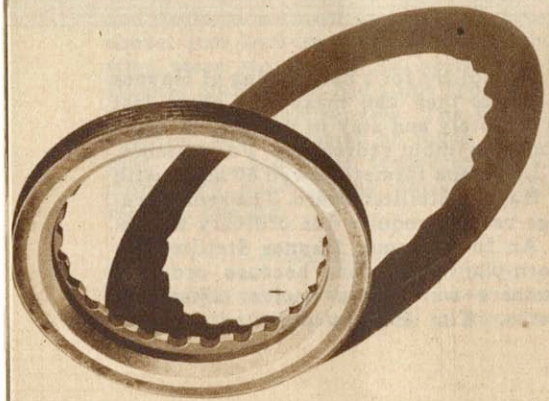
Automobile Exhaust Valves

When metal parts are exposed to both wear and heat, their life is usually expensively short. For example, the exhaust valves and seats on motor trucks and buses usually wear so rapidly that they have to be reground every 10,000 miles. Yet Haynes Stellited exhaust valves and seats have lasted 100,000 to 150,000 miles and have needed no regrinding even then.

Hascrome

Haynes Stellite, as we have seen, is unexcelled for protecting metal surfaces from abrasive wear. Certain equipment, however, is exposed to both wear and shock and not much heat. For example, a steam-shovel bucket is rammed against rock and earth with terrific force. Therefore, the hard-facing on it must be both hard and tough.

Haynes Stellited automobile valve seats for greater mileage



For such jobs, the Haynes Stellite Company makes another alloy – Hascrome. It is an alloy of chromium, manganese, and iron. Hascrome is tougher—less brittle – than Haynes Stellite, and when cold it is almost as hard. Like Haynes Stellite, it can be welded to iron and steel as a hard-facing.

Hascrome is also used as a base for Haynes Stellite, especially when a badly worn metal part has to be built-up to its original contour. Hascrome is used extensively, where heat is not a factor, for protecting machines for crushing or handling coal and other minerals.

Haystellite

Excellently as metal hard-faced with Haynes Stellite or Hascrome stands up under wear, it is possible to increase its life still further with another Haynes

Hascrome protects tractor treads from wear

Stellite Company product—Haystellite.

Haystellite is tungsten carbide cast in the form of small pieces called "inserts." These "inserts" are less than an inch long and about ¼ inch square. They are called "inserts" because of the way they are used, which is as follows:

Pieces of Haystellite are set evenly over the surface of the steel or iron to be protected. Then a layer of binding material is welded to this surface, so that the pieces of Haystellite become embedded in it but not covered by it. This leaves the Haystellite projecting as hard sharp teeth.

This procedure is known as "hard-setting" and is valuable for giving a hard, strong, sharp edge to tools that are used to drill in the earth. It is widely used on oil-well drilling tools, which drill thousands of feet into the earth. It increases the life of the tools many, many times.

Haystellite Composite Rod

A more recent development for protecting such things as oil-drilling tools is Haystellite Composite Rod. This consists of a welding rod of steel binding material through which sharp irregular particles of Haystellite are uniformly distributed. When the rod is welded to a metal surface, the hard-facing consists of a layer of the binding material with thousands of tiny teeth projecting. Such a surface is unexcelled for earth-cutting tools.

Hard-setting an oil-well drilling bit with Haystellite

Cast Haynes Stellite and Hascrome

Although most often supplied in the form of welding rod, Haynes Stellite and Hascrome can also be supplied as castings. For work where the whole tool or part (rather than just the surface) must have wear-resistance, heat-resistance, or corrosion-resistance, such castings are ideal.

II. J-Metal Haynes Stellite

J-Metal Haynes Stellite is an improved grade of Haynes Stellite developed especially for the cutting tools used in lathes and milling machines. Its long life and superior cutting qualities increase the output of these machines to such an extent that the savings in time

Applying Composite Rod to an oil-well drilling bit

and labor pay for the tools many times over. J-Metal Haynes Stellite is winning as enthusiastic a reception in industry today as regular Haynes Stellite did when it speeded up production during the war. It is a thoroughly modern cutting-tool material and is used wherever production speed and economy are important.

III. Hastelloy

The alloys described above have all been alloys for resisting wear. Hastelloy is an alloy for resisting corrosion.

Corrosion is the eating away of metals by acids or other destructive liquids or gases. The rusting of steel or iron and the tarnishing of silver and brass are familiar examples of corrosion.

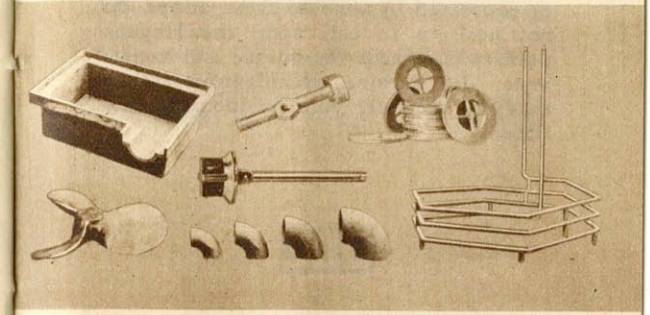
There are two ways of preventing corrosion. One is to protect the metal with a surface-coating of paint or enamel or with a plating of nickel or chromium. This is suitable for mild corrosion; but under more severe conditions, these surfacings either wear off, chip off, or become corroded themselves.

For severe corrosion, the best method is to make the metal part of some material that is naturally corrosion-resisting, or to weld such a material to the surface of the part.

Hastelloy is such a material. Acids and other corrosive agents that quickly eat away ordinary metals scarcely affect Hastelloy. Especially at high temperatures, which usually increase the violence of the corrosive attack, Hastelloys prove their superior qualities.

Hastelloy is made in three grades—A, C, and D, each of which is especially resistant to a special group of corrosive agents. Hastelloy is usually made up into castings, but can also be had as forgings, bars, plates, sheet metal, tubing, wire, and welding rods, depending upon the grade required.

It is widely used for vessels, piping, valves and machine parts where chemicals, acids, and oils are handled. Its exceptional strength makes it especially



Typical corrosion-resisting Hastelloy parts

valuable for vessels and piping that handle dangerous chemicals.

Powerful Allies

The above-mentioned products of the Haynes Stellite Company are everywhere recognized as powerful allies in Industry's war on its two most profit-destroying enemies—wear and corrosion. In sponsoring their practical application and encouraging new uses for them, Union Carbide and Carbon Corporation feels that it is rendering American and world industry a service whose value is far beyond what the reasonable prices of these materials would suggest it to be. If in your business you know of some machine or tool or part that might perform more profitably if it were made of—or protected by—one of these alloys, do not hesitate to call upon the Haynes Stellite Company for advice and assistance. Its service organization stands ready to consider your problems at any time.

UCC

HAYNES STELLITE TECHNICAL LITERATURE on Abrasion and Corrosion Resistant Alloys and Metal Cutting Tools

Available without cost by writing to Union Carbide and Carbon Corporation, 30 East 42nd St., New York, N. Y.

S-102—Haynes Stelliting Wearing Surfaces, Oxy-Acetylene Process
S-104—Hastelloy—The New Acid-Resistant Alloy
S-105—Hard-Facing with Hascrome
S-106—Haynes Stelliting Plowshares—The New Quick Method
S-107—How Hard-Facing Saves Money for Contractors
S-108—No More Valve Grinding
S-109—Hard-Surfacing Valves for High Temperature Steam Service
S-110—The Metal Cobalt and Some of Its Uses
S-111—Standard Haynes Stellite Metal-Cutting Tools
S-112—Haynes Stelliting Wearing Surfaces, Electric Arc Process
S-113—Hard-Facing with Haynes Stellite Products
S-114—Haynes Stellite Products in the Oil Fields

Read These Books Too

If you have found this booklet esting, you will undoubtedly enjo others in this series:

A – UCC Products for Oxy-Acetylene Wel Cutting
B – UCC Products for Oxygen Therapy
C – UCC Lighting Carbon Products
D – UCC Industrial Carbon Products
E – UCC Pyrofax Gas
F – UCC Synthetic Organic Chemical Pr
G – UCC Vinylite—The Thermoplastic
H – UCC Products for Alloy Steels and I
I – UCC Carbon and Graphite Electrodes cialties
J – UCC Haynes Stellite Products
K – UCC Eveready Flashlights and Batt
L – UCC Eveready Prestone
M – UCC Eveready Layerbilt "B" Batte
N – UCC Condensed List of Technical Li
O – UCC Condensed List of Products and Subsidiary Companies
P – UCC Story of Air and Linde Liquid onstrations
Q – UCC Story of the Electric Furnace

Ask for these booklets at the Carbide and Carbon Corporation e at *A Century of Progress,* or w them to:

UNION CARBIDE AN
CARBON CORPORATI
30 East 42nd Street, New York,