Wood Works

CARNEGIE-ILLINOIS STEEL CORPORATION

UNITED STATES STEEL SUBSIDIARY

Wood Works

STAINLESS STEEL SHEETS

In many an American city or town, two houses, each representing a different age, may stand side by side . . .

One house will be very old—yet its trim lawns, white sills, and shining windows still show pride of good ownership. This house may be roofed with protected sheet steel, and although that roof has withstood rain, snow and heat for a great many years, it is still rust-free and weathertight, and has cost little for maintenance.

Next to it stands the "new house" in the block. Stainless steel is everywhere in this home—in the pots and pans that hang neatly within the cupboards; in basic household and basement appliances; in the casement windows that never warp, stick or rattle; in the gutters and downspouts that give brightness and freshness to the home.

Many years separate these houses, even though they are only yards apart. But the *metal* used in both had a common origin:—the planished or protected sheet steel roofing in the older home; the bright U•S•S Stainless in the newer.

The chances are good that both may have been made in the same plant—Wood Works—which is still operating at its original site, chosen in 1851, near the junction of the Monongahela and Youghiogheny Rivers at McKeesport, Pennsylvania.

It is with pleasure that the management and employees of Wood Works present you with this booklet, which tells of Wood Works' past and present contributions to the American steelmaking scene.

The year was 1851, and the elderly Henry Clay was delivering some of his greatest speeches on the floor of the United States Senate, when W. DeWeese Wood began to build a small, one-story plant on the south bank of the Monongahela River at McKeesport, Pa.

One of the first sheet mills in the United States, Wood Works was also one of the first in America to develop and perfect the manufacture of sheet steel, which until that time had been almost exclusively a product of certain European mills. Within a few years, Wood Works was making its initial shipments of sheet steel into the American market, and thirty years after its founding, the plant was not only supplying the United States with large quantities of the product, but making shipments to Europe as well.

The product carried a name which developed into one of the "brand" names of the nineteenth century — "Wood's Patent Planished Sheet Iron." Users found that this metal had a long lasting finish that only extraordinary wear and abuse would remove. The highly ornamented stovepipe jackets of the period were made al-

most exclusively of Wood Works sheet iron. The bodies of highest class stoves for homes and offices were very often made of this product, and it was also used extensively as a roofing material for homes throughout the United States.

Wood Works sheet iron was made entirely of knobbled bloom iron, and was subject to patent processes at various stages during its manufacture. At the start of this process, pig iron was placed in a coke refining fire, and when the iron reached its molten stage, it was run out and taken to the knobbling fires, where charcoal was used as the fuel. As the iron cooled, it was hammered into blooms, and then rolled down into bars. In the final reduction, the bars were rolled flat into sheets, washed and charcoaled, and baked for twelve hours before being packed according to gauge. The completed packs—ranging in size from forty to eighty sheets—were heated and hammered three separate times, given a final heat, and then trimmed, assorted, stenciled and packed. This product, along with another type of smooth black sheet that would not buckle under strain, was rolled and sold in large quantities under the trademark of the Works.

In 1897, Wood Works joined the American Sheet Association, and four years later became a member of the United States Steel Corporation as a plant within the American Sheet and Tin Plate Company. In 1936, with the merger of the American Sheet and Tin Plate units into Carnegie-Illinois Steel Corporation, Wood Works became one of the fourteen plants of Carnegie-Illinois, the largest subsidiary of the United States Steel family.

The first loud honk of the automobile horn found its echo in Wood Works, where requests arrived from the new industry for the development of sheet steel for deep drawing to form fenders and other body parts. In subsequent experiments, Wood Works participated in the development of a steel sheet to which enamel would firmly adhere. This product reached the market under the trade name of U•S•S Vitrenamel.

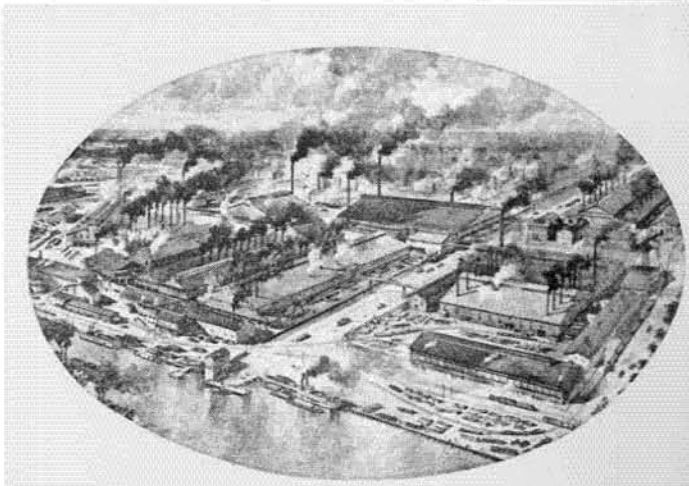
In 1928, Wood Works began the rolling of stainless sheets, and at the present time Wood Works rolls a considerable portion of the stainless steel produced by the Carnegie-Illinois Steel Corporation, although stainless steels are also rolled in various forms at other Carnegie-Illinois plants, such as Duquesne, Homestead, Gary Sheet and Tin Mill, Gary Steel Works and South Works.

U•S•S Stainless is rolled and finished in many grades, as it may be processed by different fabricators into such varied items as milk and dairy equipment, airplane parts, costume jewelry, turbine parts, equipment for the chemical and dyeing industries, cooking utensils, tableware, surgical instruments, and a host of other products where corrosion resistance, resistance to oxidation at elevated temperatures, and great strength and ductility are required.

Shortly after World War II, announcement was made of a new and important steel alloy developed at Wood Works. Now known as U•S•S Stainless "W" (with the "W" standing for the plant's name), this new form of stainless steel utilized chromium, nickel and titanium alloying elements to form a product with a remarkable hardness obtained throughout its cross section by an age-hardening heat treatment. In our air forces, it was used on slides for pilot enclosures on fighting planes, as well as in high stress structural parts of aircraft. It is used commercially in such products as plug valves, valve seats, pump valves, cams, rollers, ferrules and thrust plates.

While research and development activities are carried on at Wood Works, production and customer problems are also continually under consideration and study.

Engineering and research, however, are not the sole factors behind a U•S•S Stainless label that is applied to a Wood Works steel. The individual workmanship that goes into the preparation of every sheet that leaves this plant is best indicated as we follow the course of a steel plate from the receiving room to finishing department of Wood Works of Carnegie-Illinois.

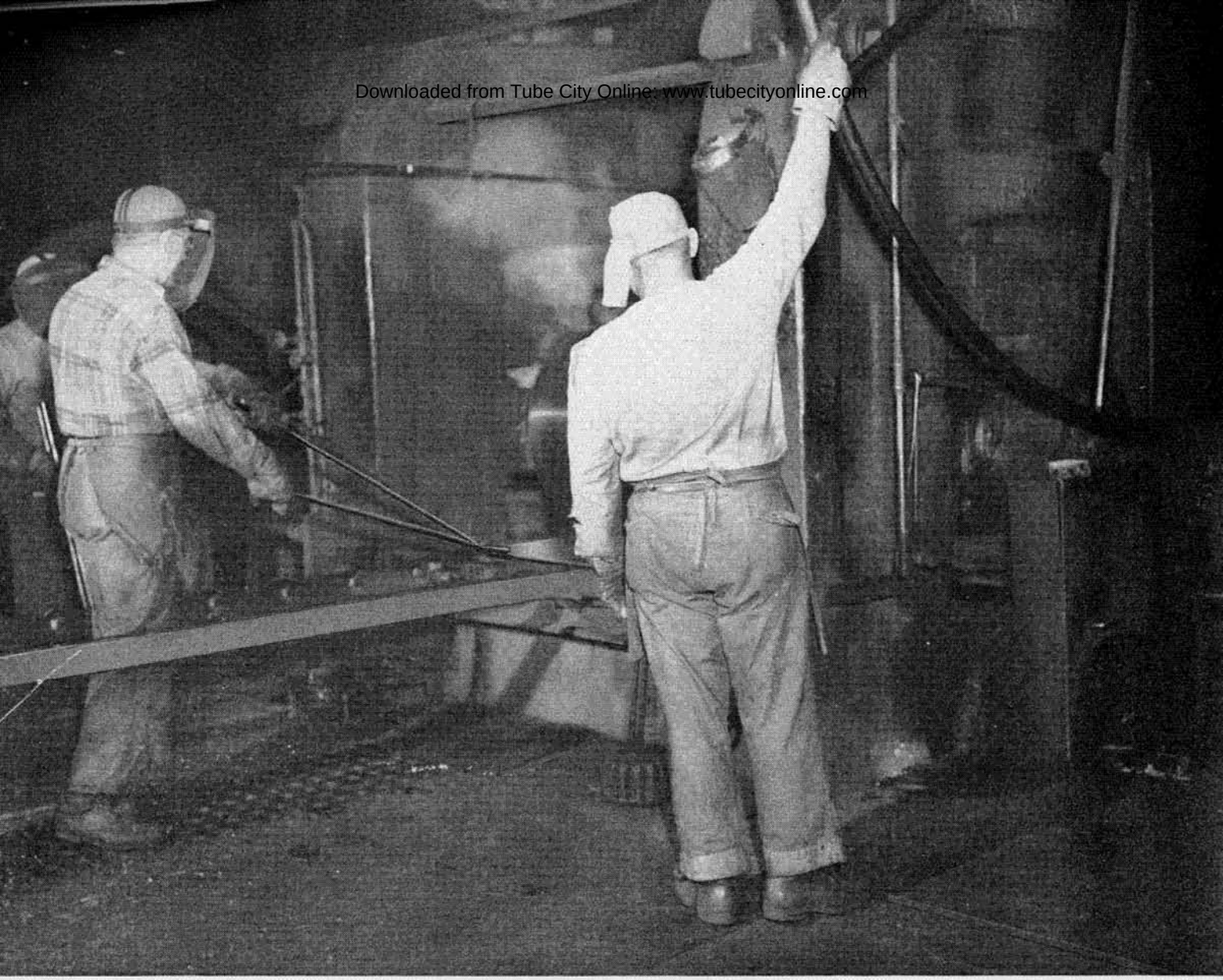


Wood Works in the early Nineties.

Steel, at approximately 2,000 degrees F, leaves the hot mill heating furnaces.

Plate is carefully hand conditioned.

Plates of stainless steel, produced in the electric melting furnaces of Duquesne Works, and rolled at the Homestead Works of Carnegie-Illinois, are received at Wood Works, where they are identified, sheared, and stocked according to production orders. The steel is charged into a gas-fired heating furnace, and heated to rolling temperatures that may run up as high as 2150 degrees F. In the heat of the gas flame, the steel plate gradually softens and becomes more malleable in preparation for its entry into the hot mill rolls.

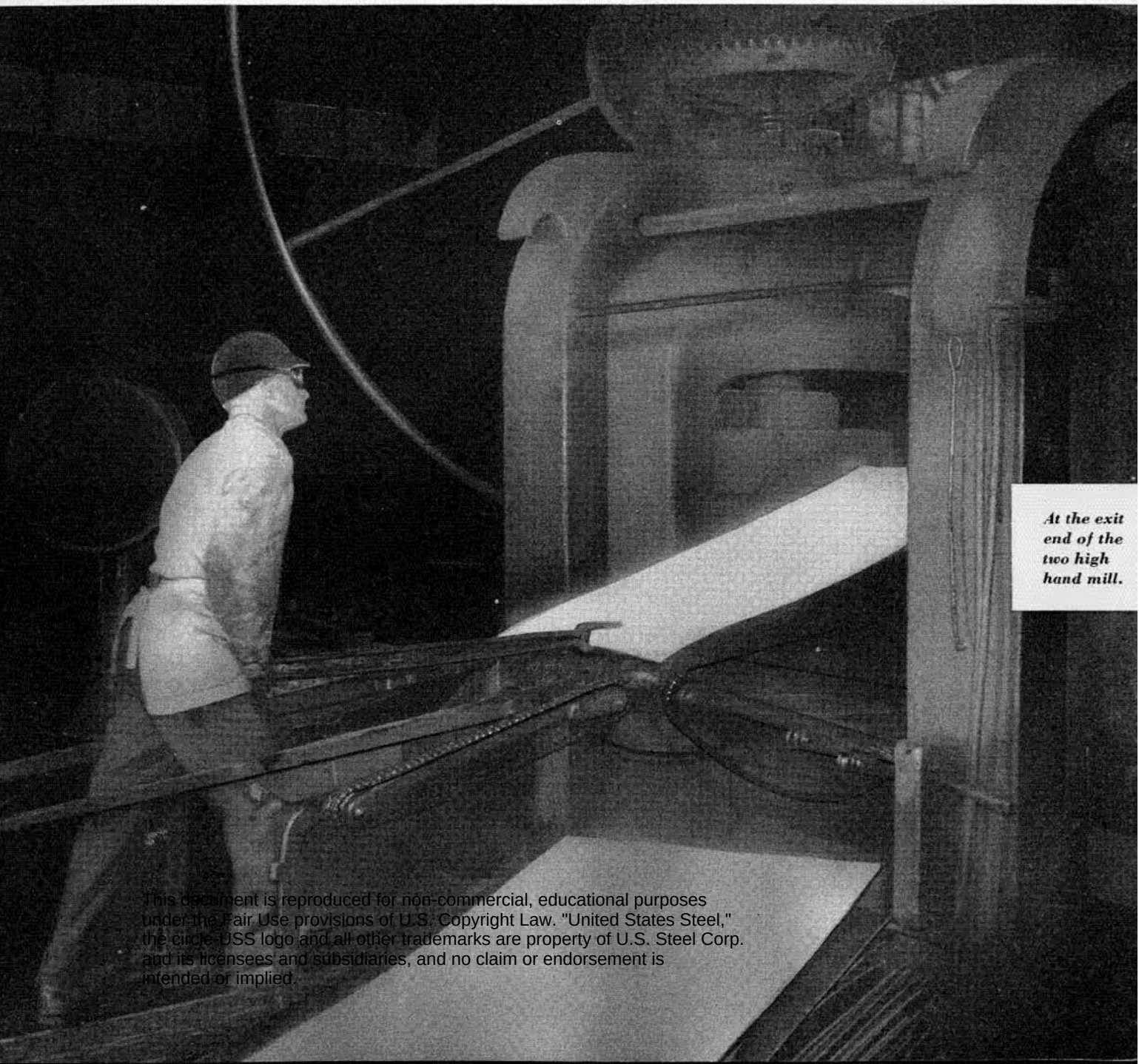


The entrance side of the two high hand mill.

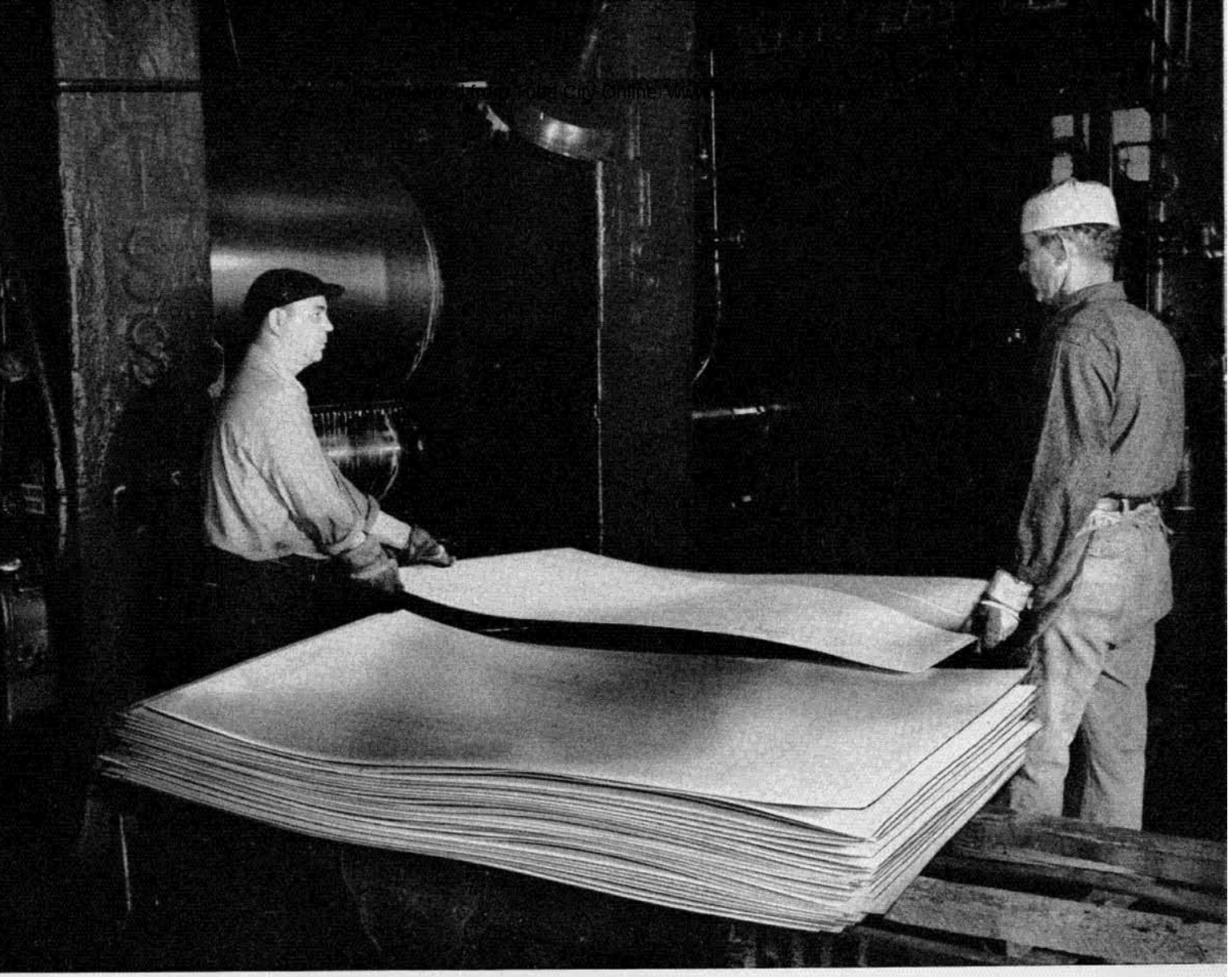
While it is true that steel receives most of its basic ingredients in the melting furnaces, it does not obtain its final characteristics there. The rolling mill gives to the steel slab or sheet much of its "temper," wearing quality, and surface appearance. In the hot mills of Wood Works, perfect teamwork of expert rolling crews is reflected in the rolling operation, where the sheet, at initial white heat, is passed back and forth through the rolls for dimension and grain structure. Each pass through the hot mill reduces the thickness of the sheet approximately ten per cent, with three to five passes obtained in one heat. Often the sheet will be placed back in the furnace for additional reheating during the rolling process. Depending upon the gauge requirements, some sheets are rolled singly, or in packs of two, three and four.

Some idea of the experience that goes into the making of stainless steel is tied into the fact that three men of one rolling crew of Wood Works have a total of 110 years of hot mill experience divided among the three members. Although the work calls for a high display of speed and skill in the manipulation of hot steel, the hot mill department of Wood Works has not shown a lost time accident at this writing in more than twelve years.

In the hot rolling process, an automatic polisher operates constantly, in order that the rolls will be kept clean and smooth at all times to insure a quality surface.



At the exit end of the two high hand mill.

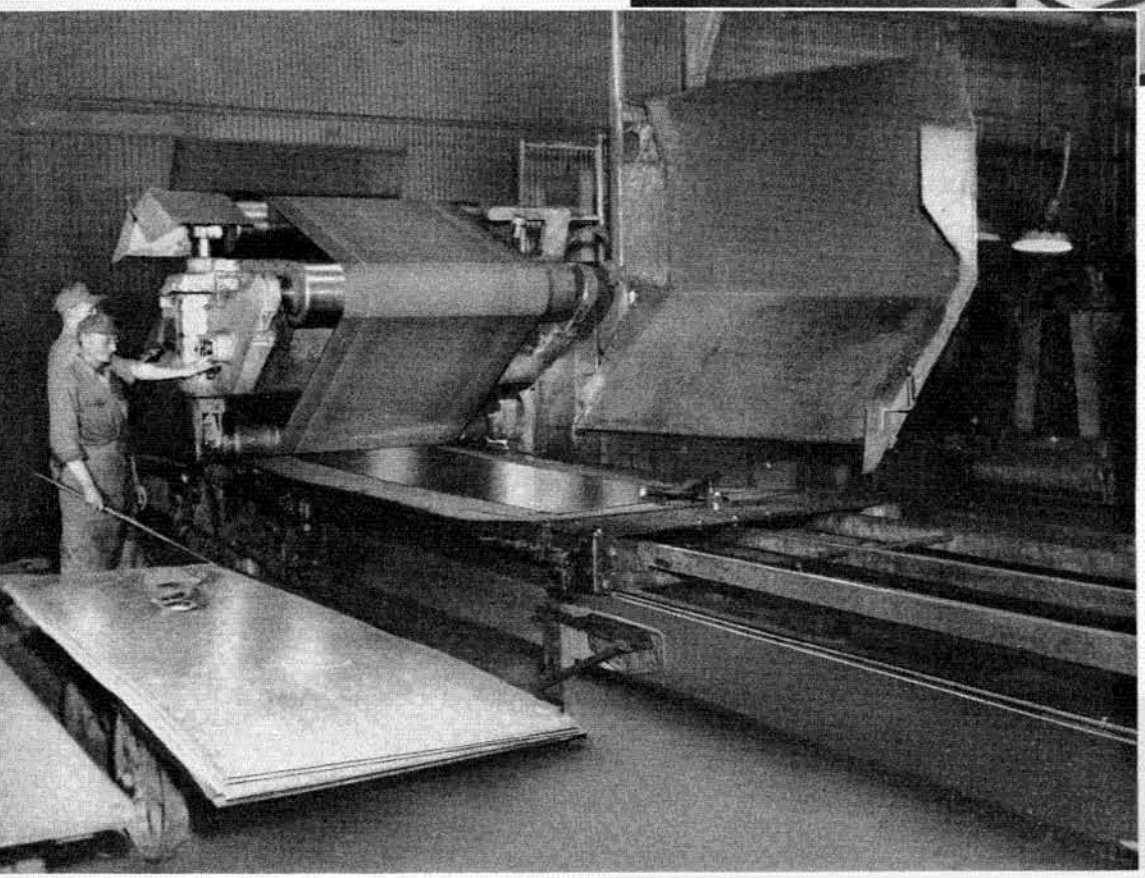


Feeding stainless steel sheets into the cold rolls of Wood Works.

Cold rolling is the process of passing steel at ordinary temperature between forged steel rolls for surface refinement and proper gauge and length. Sheets may go through these mills from three to five times, and are hardened on each successive pass.

Some of the cold-rolled steel is annealed to obtain the various mechanical properties for which the stainless family is known and used. In the annealing line, where temperatures of approximately 1950 degrees Fahrenheit are used, an oxide forms on the sheet surface, which is removed by a separate descaling process with sodium hydride. Acid baths help to complete the removal of the surface scale, as well as to "bleach and whiten" the sheet. The sheet is then rinsed under high pressure water sprays and passed through drying equipment.

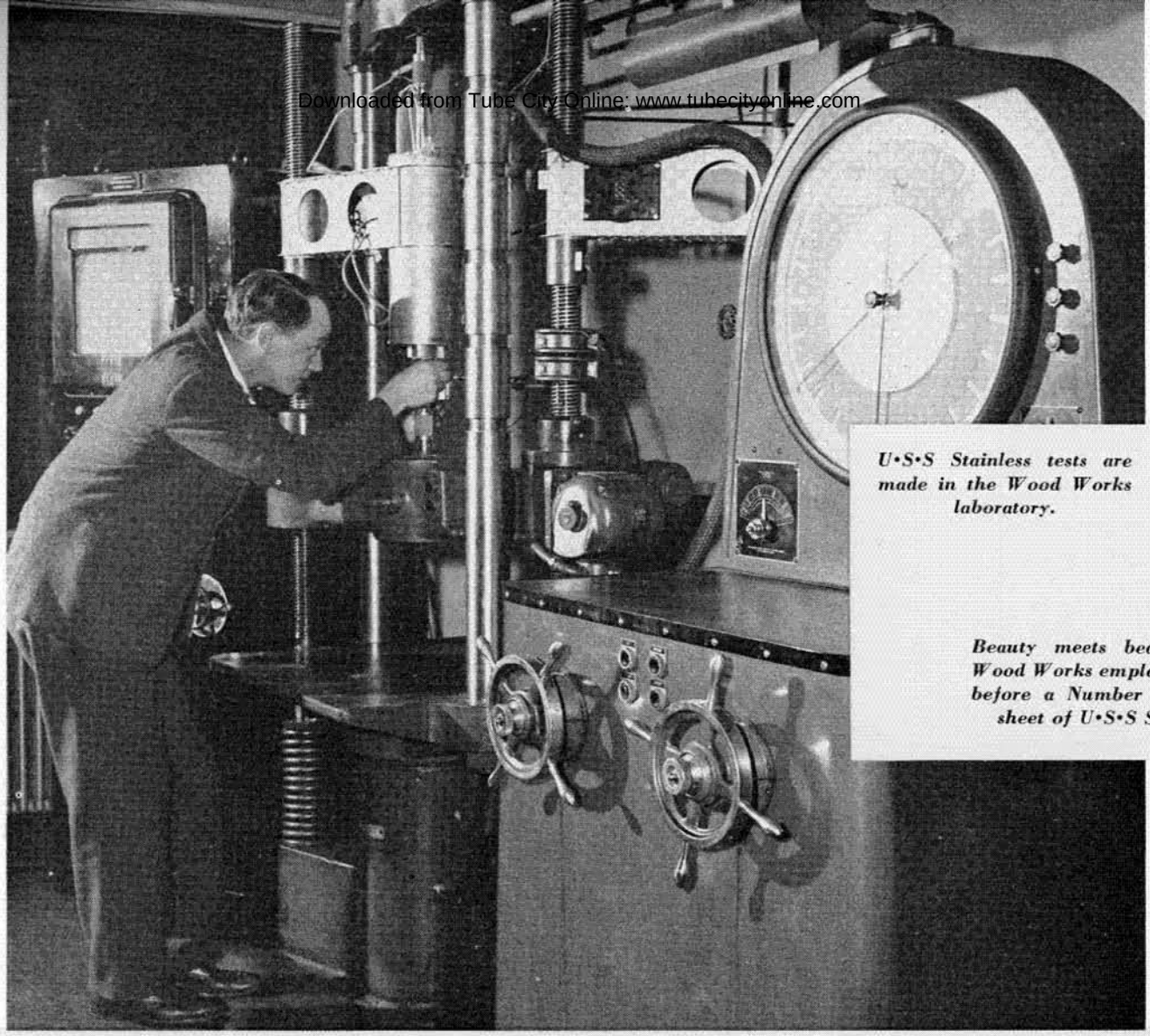
An abrasive belt gives stainless its polished finish. The safety guard is removed to show belt in operation.



Stainless sheets are boxed for shipment.

In the flattening and polishing operations, stainless steel assumes the characteristics that make it immediately recognizable wherever it is used for general purposes. Flattening removes waves, buckles and twists that occur during hot rolling and cold rolling. This is accomplished by the process of roller leveling or stretcher leveling. When a high degree of flatness is specified, the sheets are stretcher leveled.

The polished finishes of stainless steel must be free of pits, streaks, scratches and other surface marks, and consequently, every sheet that leaves Wood Works is inspected for thickness, size, uniformity of color and finish. All sheets are sheared to the customer's specifications before being packed for shipment and each sheet is inter-leaved with paper to protect the finishes during shipment.



U•S•S Stainless tests are made in the Wood Works laboratory.

Beauty meets beauty, as a Wood Works employee pauses before a Number 7 finished sheet of U•S•S Stainless.

Stainless steel sheets are supplied in pickled, cold rolled, and polished finishes which are more or less standardized. The finishes are identified by numbers, and the principal ones are these—

Number 1: A hot-rolled, annealed and pickled sheet that is rarely used as a basic material for subsequent polishing or buffing, but is utilized chiefly for technical applications.

Number 2D: To produce this finish, a sheet carrying a Number 1 finish is cold reduced, pickled, and annealed. The finish is usually specified for most articles that are to be polished or buffed after severe forming. The steel possesses excellent drawing qualities.

Number 2B: This finish, produced by a final light cold-rolling called a "temper pass," is used for shallow, bright products such as pans, serving trays, and decorative stampings.

Number 4: The standard polished finish with all surface imperfections having been removed to produce a uniform bright satin finish. One or both sides of the sheet are polished as desired.

Number 6: Known as "Tampico Finish," Number 6 is a conservative, soft, satin finish of low reflectivity, and is used mainly where glare or brilliant reflections are not desired. A characteristic use of this steel is in architectural work, where it is utilized for contrasting effect with higher finishes.

Number 7: The "Mirror" finish is the most famous of the stainless family, and produces a high reflectivity that lasts through the years.

Number 4, 6 and 7 finishes are all ground and polished finishes, chosen for applications where the steel will be used "as received" from Wood Works. Typical applications are in dairy equipment, kitchen and cafeteria equipment, soda fountains, decorative work and trim.

GRADES OF STAINLESS STEEL

The following tabulation presents a brief summary of the various grades of stainless steels that are rolled at Wood Works, and some of their typical uses:

Type	*Grade*	*Typical Uses*
301	USS 17-7	High tensile strength applications (such as exterior of railway coaches).
302) 304)	USS 18-8	Most predominately used stainless for general purposes (as in kitchen sinks, architectural trim, restaurants).
303	USS 18-8Fm	Free-machining grade, used in bolts, nuts, and valves.
309	USS 25-12	High temperature oxidation resistant applications as in furnace parts.
310	USS 25-20	Jet planes, aircraft heaters.
316) 317)	USS 18-8 Mo) USS 19-9 Mo)	Corrosion-resistant applications, such as in pickle tank crates, textile and chemical tanks and conveyors.
321 347	USS 18-8 Ti) USS 18-8 Cb)	Aircraft and Welding applications.
405	USS 12 Al	Petroleum industry (such as bubble caps and liners).
410	USS 12	Coal screens and steam turbine blades.
430	USS 17	Automobile trim.
446	USS 27	High temperature oxidation resistant applications.
501) 502)	USS 5 Cr-Mo	Oil refineries (cracking still tubes).
322	USS Stainless "W"	Age hardenable grade of chrome nickel stainless steel.