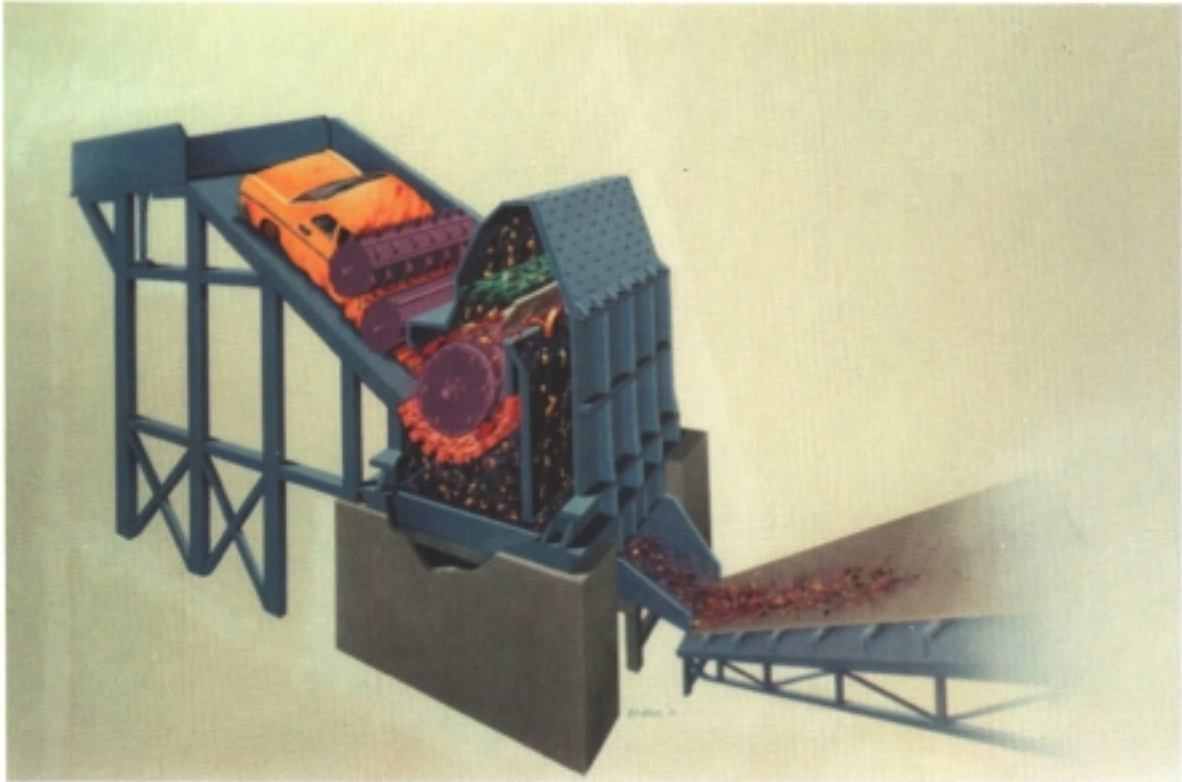


THE NEWELL SHREDDER

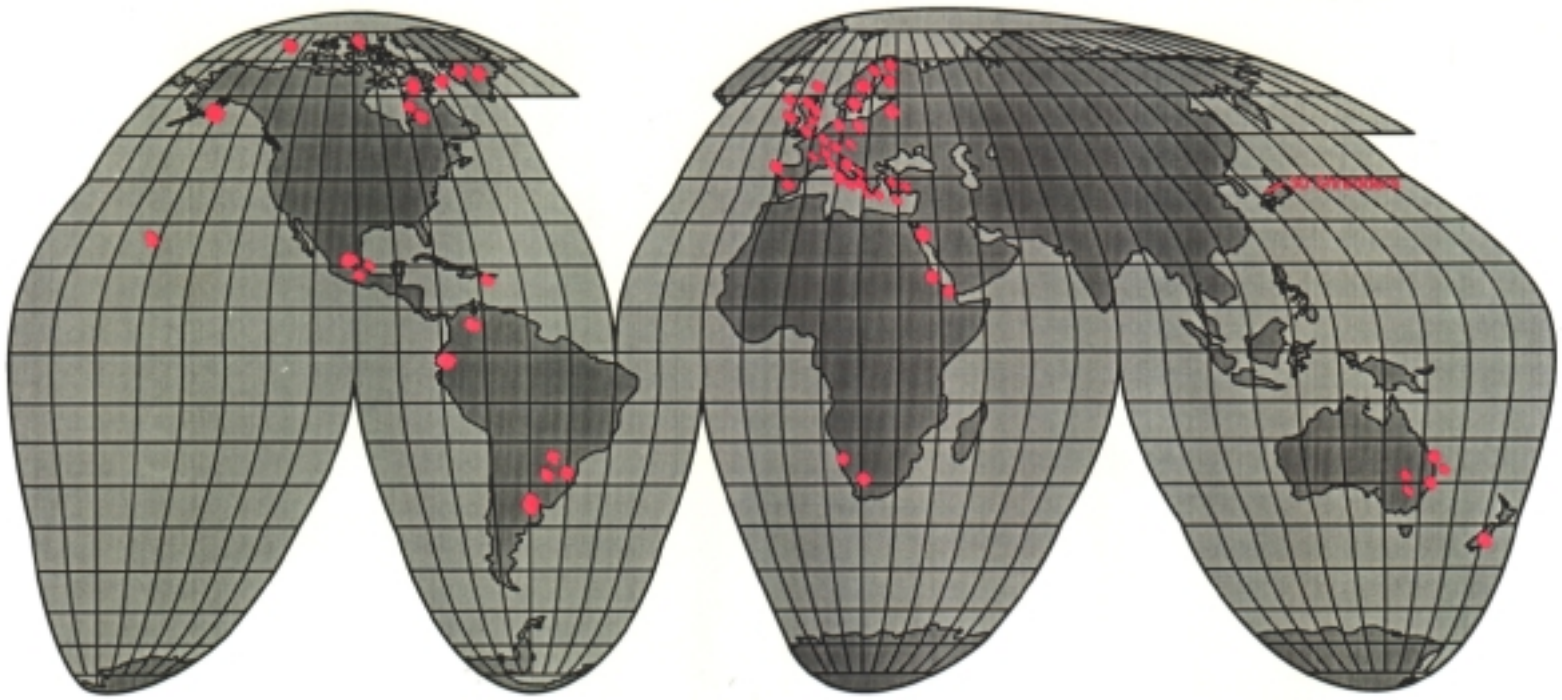


A National Historic
Mechanical Engineering Landmark



The American Society of
Mechanical Engineers

San Antonio, Texas
16 September 1994



Locations of Newell Shredders Worldwide



History

With the realization of one brilliant idea, Alton Scott Newell revolutionized the scrap metal industry and significantly contributed to the ongoing effort to recycle used metals and conserve the Earth's precious resources. His invention of the Newell Shredder offered a method of scrapping metal that created a better end product with drastically reduced energy and processing cost.



The development of the shredder was the product of many years of hard work and dedication to the scrap industry. Newell was born into humble circumstances in Oklahoma in 1913. His family lived primarily as migrant workers, first in Oklahoma and then in California. In order to help support his family, Newell ended his formal education somewhere in the middle of 10th grade. He then made his living in a variety of jobs, but found his most valuable work experience as the manager of a junk yard. This “management” position came with its share of hard work. It was here that Newell learned first-hand about scrap metal and car parts; he scrapped cars by hand with only a sledge hammer, a wrench, chisels, and axes. It took one man a ten-hour day to scrap one junked car. In Newell's view, there had to be a better way.

In 1938, Newell and his wife, Winnie, left California and moved to Texas, where he bought a small junk yard. He began to meet with success after he built a portable metal baler from materials he found in his own junk yard. About ten years later he bought land for a new yard in San Antonio, Texas, and a short time later was provided with the opportunity to purchase a modern scrap yard very near his original property. He did so and expanded his already successful business.

By the late 1950s Newell was operating a number of scrap processing plants across the Southwest part of the USA. It became apparent that a market existed for shredded tin cans for sale to copper mines as the ferrous input to the chemical process of a leach-precipitant, copper-recovery mining procedure. As Newell was already handling tin cans, this seemed to be an economic opportunity. Newell recalled a machine he had seen in the 1930s at Los Angeles By-Products Company which shredded metal cans and other light scrap. He also remembered that, as a boy in Kansas, he had seen a grain crusher that processed grain and then blew it up to a storage silo. With these thoughts in mind, and with his experience of cutting old automobiles apart with an axe, Alton Newell began to design a shredding machine.

The tin-can-shredding operation was a success and it became possible to sell more shredded tin cans than the amount of unprepared tin cans available. This led to an effort to shred other types of material, such as automobile body parts.

Eventually, the quality of the shredded material was such that steel mills became interested in using the material in the steel-making process. As soon as a market for heavier shredded material was recognized, Alton Newell decided to build a shredder that would be able to handle a complete automobile.

Several other companies were interested in processing this type of scrap for steel mills, including a company which had been in the tin-can-shredding business. Eventually, they found that it was possible to sell shredded automobiles and other types of light scrap—less than 1/4 inch (6-mm) thick—to steel mills.

This shredder did not have a limited-feed arrangement so whole cars were fed as one piece into the shredder. Thus, it used a rotor with a ten-foot-diameter hammer circle driven by a 6,000-horsepower (4,440-kw) motor. These features made the shredder so big and expensive that there were only a very few locations in the world that had enough raw material available to justify this type of investment.

During the late 1950s and the early 1960s several companies that manufactured rock crushers began to modify some of their designs so that their equipment could handle scrap metal. Most of these companies soon abandoned their efforts, but the few machines that were eventually developed to acceptable productive capacity adopted some of the features of the Newell shredder, such as the limited side feed system.

The traditional method of processing junked cars was to torch by hand, or to shear or bale with large hydraulic equipment. Automobile bodies were first burned to remove all non-metallic materials, such as upholstery and rubber. This process produced as much as 5 per cent of the air pollution in major U.S. cities at the time.

Steel mills began demanding better quality scrapped ferrous metal for their furnaces during this time. In response to the need for better scrap and the need to provide that scrap in a way that was good for the environment, Alton Newell continued his search for a solution.

Alton Newell knew there had to be a better way to shred cars and other large, ferrous items. Recalling the hammers and axes he used to manually dismantle cars, and the grain crusher, Newell developed a top-discharge shredder containing a rotor with hammers to beat and break up the metal pieces. More importantly, it required only a 500-HP (370-kw) motor—which made Newell's shredder much more affordable than a shredder requiring a 6,000 HP (4,440-kw) motor. This was achieved by a limited-feed device that controlled the rate a car was fed into the shredder, and a system to reject unshreddable pieces of scrap. Additionally, the reject device allowed the shredder to discard unshreddables without downtime or extra manpower to manually remove the unshreddable pieces. The reject equipment also saved wear and tear on the shredder parts, so the shredder would process more with less damage and fewer replacement parts. Finally, Newell designed his shredder with a top discharge feature, which eliminated the need for large, expensive foundations.

Because his shredding machine incorporated these unique features, Newell applied for a patent in 1965. The Patent office granted patent number 3,482,788 four years later.

Of the eight claims allowed, the more significant ones covered: (1) upper location of grates, replacing the lower location of grates in prior shredders, (2) pivotally mounted hammers designed to provide sufficient energy to shatter the scrap being processed and propel the shredded scrap to the top grates, and (3) anvils designed to absorb heavy blows while allowing free passage of hammers after shredding. The upper location of the grates permitted scrap pieces not passing through the grates the first time, to be struck repeatedly after falling back into the hammer circle.



Conventional shredders that existed for other applications, were for the most part top-feed and bottom-discharge designs. The side-feed, and top-discharge design allowed for a limited-feed arrangement where scrap could be shredded at a controlled rate. This was one of the features that differentiated this shredder from previous designs. The top discharge also allowed for a very effective reject

door that allowed the operator to bypass the grates when an unshreddable item was introduced into the shredder. The patent identifies the material of the striking surfaces to be made of impact-resistant steel alloys containing, for instance, manganese, chromium, nickel, silicon, and carbon.

The second Newell shredder, capable of shredding an automobile, is the landmark now on display on the grounds of a Newell plant, in San Antonio, Texas. It featured a hammer circle of 36 inches (91-cm) and an internal clearance of 104 inches (264-cm). This would be named a 36104 top-discharge shredder.

Shredder Operating Principles

Figure 1 illustrates the shredder operating principles. Hammers are connected to the rotor through axles called hammer pins. There is, as a general principle, one hammer between each set of two discs. In the early shredders, there were thirteen discs, which provided for twelve hammers. As there were six pin positions around each disc, there were seventy-two places where a hammer could be placed. When twelve hammers were utilized, then the other sixty places were covered with castings called pin protectors. The hammers were placed around the rotor in balanced positions. The discs themselves took no direct blows, which instead were taken by the hammers as they did their work on the anvil, thus reducing the wear and cost of maintenance. The disc design also was convenient for automatic welding for hard surfacing during maintenance periods.

As the discs rotated, the hammers extended from the rotor due to inertia. When they hit a piece of scrap, the energy was transferred from the hammer to the scrap. If the scrap piece did not immediately fragment, then the hammer could deflect backward away from the scrap. It might even bounce all the way around, 360 degrees, but it always would return to the extended position.

The walls of the surrounding chamber, called the shredder housing, must contain the flying pieces of scrap and efficiently direct those pieces to the grate areas.

A car was hoisted onto the infeed conveyor and then passed down a chute where it was fed into the limited feed roller, which flattened out the automobile body. An operator monitored the amount of electrical current that was being required by the main drive motor and turned the feeding device on and off. This controlled the amount of scrap entering the shredding chamber and evened out the power requirements and the stress on the hammermill. As the car passed over an anvil, twelve manganese steel hammers began to pound and fragment it. The shredded pieces of automobile passed through a grate into the top discharge unit. If a piece of scrap was too large to pass through the grate opening, it dropped back down into the shredder for further fragmenting. Any unshreddable scrap which could not pass through the grate was ejected through a reject door, thus eliminating potential damage to the shredder. The shredded material that passed through the grates deflected and dropped as an air system, powered by a 150 HP (111-kw) fan, picked up and separated the lighter or non-metallic waste material and then removed it.

When scrap is fragmented, or shredded, it is possible to separate various components through the use of magnetic separations, or air separations or water separations making use of magnetic or density properties of the scrap pieces. This increases the purity of the steel scrap produced. The old methods of preparing scrap by hand torching, shearing or baling changed the shape of scrap, but did not allow any of the non steel parts to be separated. This separated scrap has more value added.

Effect on the Industry

Shredders using this principle are now manufactured in sizes ranging from 500 HP (370-kw) to 6,000 HP (4,440-kw). The most common shredders used today are Super Heavy Duty Shredders, (SHD), which range from 1,000 HP to 6,000 HP (741-4,440-kw). Output for a typical 4,000 HP (2,960-kw) Super Heavy Duty Shredder averages at 120 tons per hour, the equivalent of about two cars per minute.

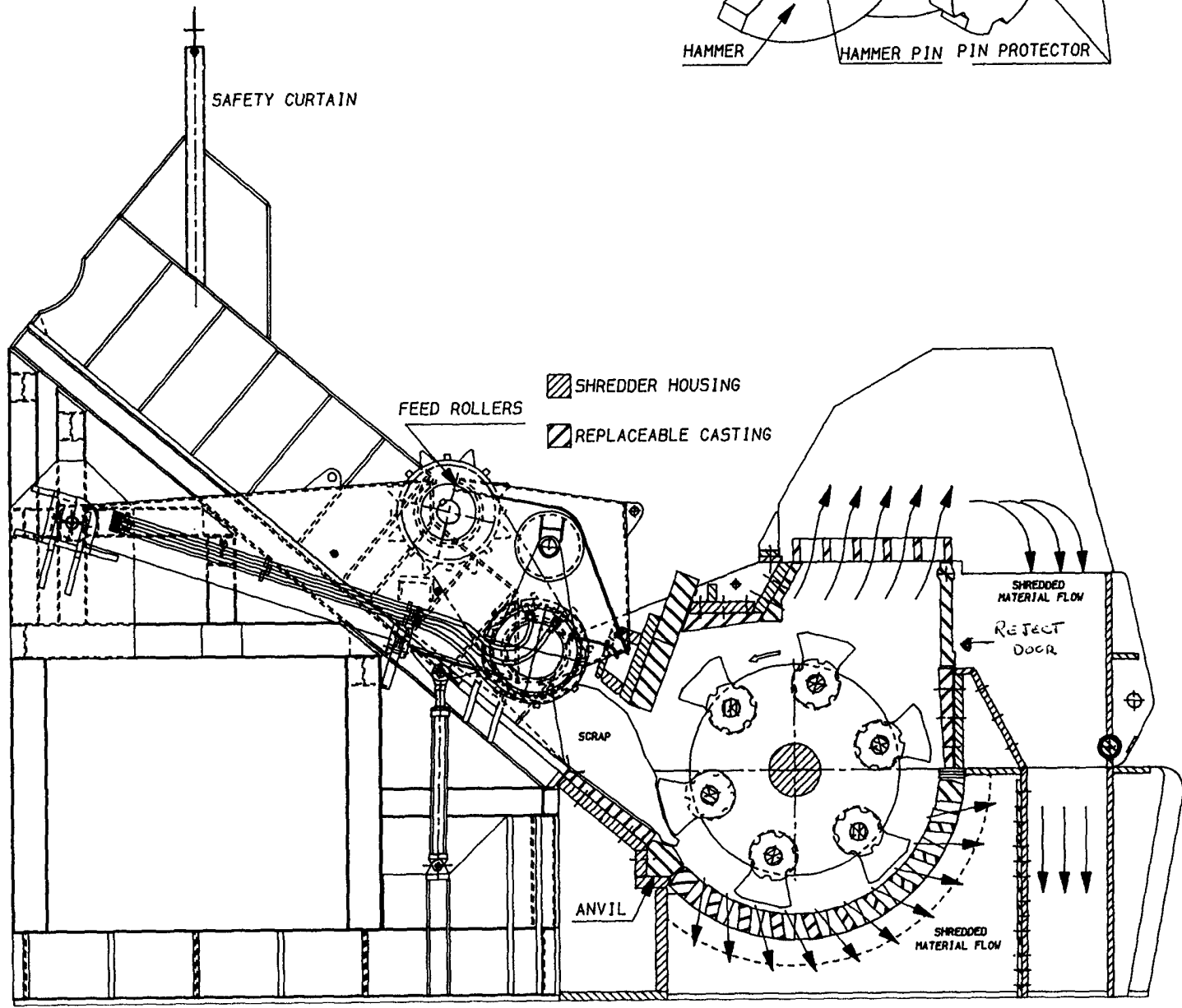
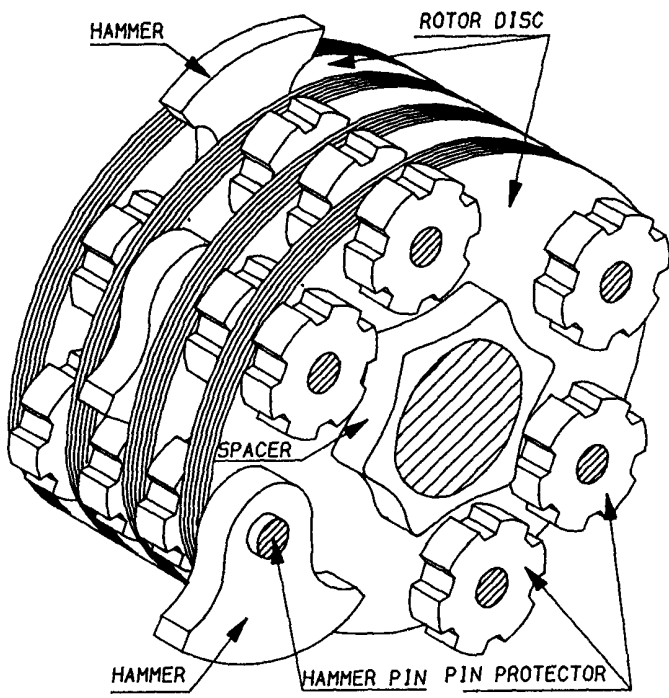
In addition to the large shredders, Newell Industries has applied the original shredder ideas to other applications. Today, Newell Industries manufactures aluminum shredders, cooling scrap shredders, preshredders, slag crushers, rock crushers and municipal and solid waste shredders. Innovations are constantly being added to the product line to improve shredder capability.



courtesy of Scrap Processing and Recycling

In short, Alton Newell revolutionized an entire industry. Because of his invention, shredding scrap metal became economical. This created a boon for the scrap industry and encouraged the recycling of junked automobiles and other used metal. Utilizing energy economically, shredding and reusing metal scrap has reduced a major pollution problem by removing junked metal from landfills. Additionally, recycling steel requires less than one-half the energy it takes to produce it from ore. The cost of recycling aluminum versus extracting it from ore requires one-seventh the energy. Alton Newell's shredders have provided benefits reaching far beyond the scrap industry. As more old metal has been recycled, less energy has been used to prepare steel and other metal products, and pollution has been diminished.

It is interesting to note that all of these impacts on an industry were made by a man and a company that evidenced the highest standards of ethical conduct. The company motto always has been, "We will treat you right." The following is an anecdote that illustrates that ethical conduct in the real world. When Scott Newell Jr. was about 20 years old, he and his father made a scrap processing agreement with a steel mill. When they left the client, Scott said, "Dad, we could have made a better deal." His father replied, "Yes, Scott, we could have, today. But in a few weeks, they would know that it wasn't such a good deal, and they wouldn't be so happy with us." Scott Newell, Jr. now fifty five, observes, "I learned that it is better to have a good name than it is to make money on one deal and I am happy to report that we had a good relationship with that steel mill for the next twenty years."



Today Alton Newell remains in charge of Newell Recycling, which runs eight recycling plants throughout the United States. His son, Alton Scott Newell, Jr., with the help of his grandson Alton Scott Newell, III, run Newell Industries, which manufactures the shredders Mr. Newell, Sr. invented. Even though some of the Newell patents have expired, Newell Industries still manufactures well over half the shredders used in the United States today. As these patents expired, other shredder manufacturers incorporated the unique Newell design into their shredders. This design is now used in most shredders manufactured throughout the world.

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The History and Heritage Program of the ASME

The ASME History and Heritage Recognition Program began in September 1971. To implement and achieve its goals, ASME formed a History and Heritage Committee, initially composed of mechanical engineers, historians of technology, and curator (emeritus) of mechanical engineering at the Smithsonian Institution. The Committee provides a public service by examining, noting, recording and acknowledging mechanical engineering achievements of particular significance. The History and Heritage Committee is part of the ASME Council on Public Affairs and Board on Public Information. For further information please contact Public Information, American Society of Mechanical Engineers, 345 East 47 Street, New York, NY 10017-2392, (212) 705-7740.

**NATIONAL HISTORIC
MECHANICAL ENGINEERING LANDMARK
NEWELL SHREDDER
1969**

THIS MACHINE, DESIGNED BY ALTON S. NEWELL, EFFICIENTLY REDUCED AUTOMOBILE BODIES INTO SCRAP METAL FOR RECYCLING. A BODY WAS FED INTO THE SHREDDER AT A CONTROLLED RATE, AND ROTATING HAMMERS, DRIVEN BY A 500 HP MOTOR, SHREDDED IT INTO SMALL PIECES THAT WERE EASILY SHIPPED. THE PROCESS TOOK ABOUT TEN MINUTES PER CAR AND USED MUCH LESS ENERGY THAN OTHER SHREDDING AND CRUSHING MACHINES. MODERN, FASTER VERSIONS OF THE NEWELL SHREDDER REMAIN IN SERVICE.



THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS - 1994

NL 111

Designation

The Newell Shredder is the 111th National Historic Mechanical Engineering Landmark to be designated. Since the ASME Historic Mechanical Engineering Recognition Program began in 1971, 165 Historic Mechanical Engineering Landmarks, 6 Mechanical Engineering Heritage Sites, and 6 Mechanical Engineering Heritage Collections have been recognized worldwide. Each reflects its influence on society, either in its immediate locale, nationwide, or throughout the world.

An ASME landmark represents a progressive step in the evolution of mechanical engineering. Site designations note an event or development of clear historical importance to mechanical engineers. Collections mark the contributions of a number of objects with special significance to the historical development of mechanical engineering.

The ASME Historic Mechanical Engineering Recognition Program illuminates our technological heritage and serves to encourage the preservation of the physical remains of historically important works. It provides an annotated roster for engineers, students, educators, historians, and travelers. It helps establish persistent reminders of where we have been and where we are going along the divergent paths of discovery.

Acknowledgements

The San Antonio Section of the American Society of Mechanical Engineers gratefully acknowledges the efforts of all who contributed to the designation of the Newell Shredder as a National Landmark. We are especially grateful to Alton Newell, inventor of the shredder, and to Scott Newell, Jr., President, Newell Industries, Inc., for background information and details of the shredder development.

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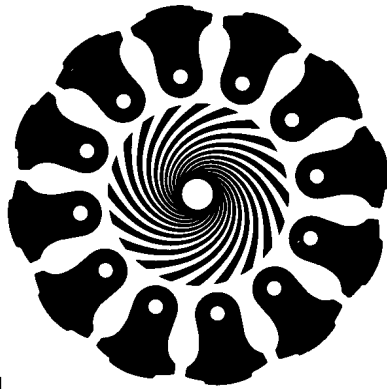
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