A Can of Worms?

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ABSTRACT

According to the Utah Division of State History, "[t]here are no experts in historic artifact identification, only people who have seen more of the variation than others (Merritt 2014:2). U.S.F.S. Archaeologist James T. Rock (1942–2010) "compiled information and provided typologies and dating techniques, including examination of seams, closures, openings, materials composition, etc. that have enabled archaeologists and historians to better interpret historical archaeological sites" (soda.sou.edu.2018). Indeed, Rock's *A Brief Commentary on Cans* (Rock 1987) is the most comprehensive monograph on the subject, yet does not discuss the innovation of the corrugated can. If the unofficial motto of Historical Archaeology is: Confirm the facts; Contradict when necessary; and Contribute whenever possible, then a revised can type, opening, and opener technology chronology is warranted. This paper presents postprocessual posits, recently published archival research, and information that promote professional praxis regarding the identification, assessment, and evaluation of historic period cans in archaeological contexts.

Introduction

London Broker, Peter Durand is credited with coining the term "tin canister" in 1810 and an anonymous William Underwood Company bookkeeper is credited with coining the term 'can'—a shortened version of canister—in 1840 (Depew 1895:396; May 1937:12; Fontana et al. 1962:67). Emigrants traveling west by wagon along primitive trails had to carry the majority of their food for the four- to six-month trip with them; foods that did not spoil easily and were relatively light weight, some of which were canned (Zeide 2019:15). Gold

seekers in the American West, Civil War soldiers, French and British colonialists: all ate canned goods for the sustenance that fueled their ventures (Zeide 2019:12). Selçuk Balamir, Ph.D. Fellow at the Amsterdam School for Cultural Analysis, finds that prior to WWI, canned food was "a military tool of European colonialism" and posits that after WWI, the tin can became "the symbol of capitalism, serving the interests of the American Empire" (Balamir 2011:5). Indeed, the preponderance of tin cans scattered along the roads and in cities prompted a Connecticut newspaper to dub the U.S. the "Tin Can Civilization" (Meriden Morning Record, 22 March 1922:13; Sandor and Rose 2017:149).

Sanitation was another driver of improvements in canning technology from the beginning. Easier, more efficient means of can construction, opening methods and devices, and consumer safety and satisfaction have also been key to success. National Park Service (NPS) Themes into which canneries can be situated include Developing the American Economy and Expanding Science and Technology; if related to Railroads, Military, and/or Emigrant Trails, the Peopling Places theme may also apply. Tin cans can be situated within historic contexts if enough information is available. But are cans significant? Do they retain enough aspects of integrity to substantiate essentialist or exemplarist eligibility for listing on a heritage register under any Criteria in and of themselves? It depends.

Historical Overview

"An army marches on its stomach"

—Napoleon Boneparte and/or Frederick the Great

Tin plating was successfully developed in Bohemia in the 1300s and improved in Saxony in the 1600s (Clark 1977:11). In the 1670s, the process was brought to Great Britain. From 1784 to 1795, Nicolas Appert, a young confectioner, pickler, preserver, vintner, brewer, distiller, and chef from the region of Champagne, France, experimented with wide-mouthed glass jars for preserving foodstuffs by sealing contents with wax, a cork with a wire stopper,

and placing the jars in boiling water (Clark 1977:11; Collins 1924:3), i.e. appertization, a sterilization-preservation process that involves cooking the food contents in excess of 70°C (158°F). Pasteurization involves heating a liquid between 60°C and 100°C (between 140°F and 212°F); both methods kill *Clostridium botulinum* spores.

In 1795 the French Directory (the final phase of the nation's government following the French Revolution) determined that it was necessary to supply French forces fighting battles in Italy, The Netherlands, Germany, and the Caribbean with a stable source of food. At that time and for centuries beforehand, livestock were integral cargo on ships—for their byproducts and as direct sources of food. Through the Society for the Encouragement of Industry, the Directory, including Emperor Napoleon Boneparte I, offered a prize to anyone who could solve the problem of stable long-distance transportation of foodstuffs. Appert won the sought-after prize. In 1803 his preserved foods, which included vegetables, fruit, meat, dairy, and fish, were distributed to the French Army and Navy.

In 1808, an English Chemist, Sir Humphry Davy, discovered that salted water boiled at 240°F (116°C; Collins 1924:16). In 1809, the French Bureau of Arts and Manufactures of the Ministry of the Interior gave Appert an *ex gratia* payment of ₣12,000 on condition that he make his process public (Robertson 1998:174; Swedberg and Swedberg 1985:10). In 1810, Appert published *L'Art de conserver les substances animales et végétales* (The Art of Preserving, for Several Years, All Animal and Vegetable Substances; translated into English by Dr. A. W. Bitting in 1920). Appert's method fostered home canning.

Also in 1810, Philippe Henri de Girard worked with London Broker, Peter Durand, to receive a patent for a "substitution of glass jars and bottles with tin cases" (Figure 1) from King George III of England. Simultaneously, Augustus de Heine, worked on and independently patented a similar method.

After a successful trial with the Royal Navy in 1811, the de Girard-Durand patent was acquired by Bryan Donkin for £1000 in 1812 who later was the first to pack coffee in canisters. “Donkin applied to the British Admiralty for a test of his product and the first substantial orders were placed in 1814 for meat preserved in tinplate canisters,” (Robertson 1989:123; cf. Sacharow and Griffin 1970:9), and the world’s first commercial canning factory was established on Southwark Park Road, London (wiki.sanitarc.si 2020). “By the 1820s, canned foods were a recognized article of commerce in Britain and France” (Robertson 1989:123). Early cans featured embossed labeling. Embossing is boss and really groovy, too.

In 1856, Gail Borden improved and patented a method of condensing milk he learned from the New Lebanon, New York Shaker Colony which incorporated a globe-shaped copper vacuum pan (US15553A; Clark 1977:11). In 1858, can seams were sealed in a “joker system” solder bath (Hunziker 1914:101; Memmott 2015:5–6; Rock 1987:7–8). Borden partnered in the New York Condensed Milk Company of New York in 1860 and partnered with William Numsem & Sons of Baltimore to form the Baltimore Condensed Milk Company in 1863 (Depew 1895:397). The American Civil War was yet another opportunity for the burgeoning canning industry, yet can bulging due to botulism was still a problem. Gail Borden’s company received the contract award to supply condensed milk to Union soldiers and demonstrated that it was a safe, nutritious product (Darling and McConnell 1993:16).

In 1865, retired Union Colonel Silas Augustine Ilsley founded a tinware factory in Brooklyn, New York (Clark 1977:11, 78) that later merged with the American Can Company (ACCO) of Maywood, Illinois in 1901 (Reilly 2012). After 1866, Borden’s Eagle Brand condensed milk featured an embossed can end and a “hole-and-cap” closure.

Also in 1865, William Underwood’s sons began producing a canned deviled ham meat spread. In 1867, their famous devil logo was registered as Number 82 under the

Copyright Clause in the U.S. Constitution per the Trade Mark Act of 1870 (16 Stat. 198), one of the oldest food trademarks still in use for a prepackaged food product in the U.S. (Figure 2).

A. K. Shriver perfected and patented a steam autoclave called a retort in 1874 that delivered a higher temperature and allowed canned foods to be processed in less time (US149256A). That same year, John Fisher developed a method of 'dry' or superheated steam in a kettle that delivered even higher temperatures (Collins 1924:22-23).

In 1883, I. H. Cox of Bridgeton, New Jersey introduced a "hand-capper" that improved efficiency; the Norton Brothers Co. of Chicago, Illinois employed such a machine (Zeide 2019:23). John B. Meyenberg's Helvetia Milk Condensing Company (later Pet Milk Co. in 1923) of Highland Park, Illinois produced the first unsweetened sterilized evaporated milk in a can (labeled evaporated cream until 1906) in 1885 (US308421-308422A; Bitting 1937:737–739) and supplied U.S. troops during the Spanish American War of 1898 (Rock 1987:46).

Imported British black plate from which sheet metal and cans were made dominated the market. The U.S. Tariff Act (also known as the McKinley Tariff Act) of 1890 raised the duty on imported tin-plated steel from 30% to 70% with the provision that imported tin-plated steel tariffs would be lowered to 0% (duty free) if one-third of tin-plated steel was domestically produced by 1897.

Domestic tin-plating (packer) mills and Bessemer steel foundries came and went. Despite the Panic of 1893–1897, the canning industry ballooned. In 1896, Charles M. Ames and Julius Brenzinger of the Max Ams Machine Company of New York patented a method of mechanical roll double-crimping can ends resulting in the 'sanitary' can in 1896 (US570591A) and revolutionized the canning industry (Figure 3) (Reilly 2012; US570591A). Soon thereafter, over 100 tin and steel manufacturers, including the American Sheet and Tin

Plate Company (perintonhistoricalsociety.org 2010a:1), incorporated as the American Can Company (ACCO, alt. CANCO) in 1901. The Max Ams Machine Company, the George W. Cobb Preserving Company, and jobbers Bogle and Scott of New York incorporated and formed the Sanitary Can Company (SCC) in 1904 in Fairport, New York (Reilly 2012). Their cans are distinguished by the word SANITARY embossed on the lid (Rock 1987:104). That same year, Edwin Norton—a canner since 1868—renamed the Norton Tin Can and Plate Company and founded Continental Can Co. (CCC), and became the second largest can manufacturer in the U.S. The Metal Package Corporation, established in 1909, rebranded itself as the National Can Co., Inc. (NCC) in 1929, and became the third largest can manufacturer. The Panic of 1907 resulted in the SCC's failure "to secure loans to continue manufacturing tin cans" and so was taken over by ACCO in 1908 (perintonhistoricalsociety.org 2010b:1). The U.S. Government sued ACCO in 1913 stating the 'Tin Can Trust,' worth $88 million, was a monopoly, restrained trade, and arbitrarily fixed prices therefore should be dissolved (*New York Times* 30 November 1913:6; Zeide 2019:207); in 1916 ACCO was dissolved (230 F. 859 [D. Md. 1916]). ACCO was acquired by Triangle Industries of New York in 1986 for $570 million; in 1988, Triangle Industries sold to Pechiney S.A. of France (perintonhistoricalsociety.org 2010a:2).

Other than the lactose added to cream ales and milk stouts, there would not seem to be any connection between canned milk and beer, but there was. Due to the National Prohibition Act of 1919 (Pub.L. 66–66), more commonly known as the 18th Amendment, which went into full effect on 17 January 1920, prohibited the production, sale, and distribution of intoxicating liquors. Fortunate for some brewers, their equipment was suitable for adaptation and were able to enter the condensed milk market and save their businesses. For example, the Christian Diehl Brewing Company of Defiance, Ohio joined several local investors with milk condensing experience and incorporated as the Defiance Dairy Products Company in 1922.

The brewery resumed beer production in 1933. The Diehl Family still owns and operates the milk condensory (Miller 1995).

Gebee- and McDonald-type, Vent hole, Sanitary, Key-wind, Ribbed Cans & Key-wind Ration Cans

Gebee-type

As early as 1865, "hole-and-cap" closures on condensed milk cans (and others) were filled through a center filler hole in the top, a metal burr cap with a rim was inserted into the filler hole, and the contents appertized (Hunziker 1914:76; cf. Bitting 1937). Gebee-type "hole-and-cap" closure technology advanced canning technique and reduced material waste, but the closure was not soldered or hermetically sealed which resulted in some canisters failing food safety.

McDonald-type

McDonald-type closure cans featured flanged friction caps with a depressed center which were inserted into the filler hole, the rim was flattened flush with the can top by a series of revolving dies (Hunziker 1914:76, 98–99). Like the Gebee-type closure, McDonald-type can closures were not soldered or hermetically sealed, and resulted in some canisters failing food safety (Heite and Heite 1989:102). Gebee- and McDonald-type closures could be pried open, but the 'flat' end was typically cut with a lever-knife opener (or a knife) in order to retrieve or pour out the contents.

In cold storage conditions, Gebee- and McDonald-type cans contracted and created a partial vacuum; in warm conditions, cans expanded and bulged. Whereas sweetened condensed milk did not freeze and contents were "perfectly normal," (Hunziker 1920:249) can bulging suggested fermentation had occurred and many cans were rejected. In 1823, Frenchman Pierre Antoine Angliberg developed the "exhausting" process known as "hole-in-

cap" which allowed air to vent through a pinhole in the cap during the appertizing process. Gebee- and McDonald-type cans, therefore, cannot be called vent hole cans (Figure 4).

Vent hole

Vent hole cans offered a relatively safer product. The vent hole filling process employed gravity and automatic tipping machines more so than Gebee- or McDonald-type closure processes, thus a reduced risk of contamination due to contact with human hands and airborne pathogens or vectors. Inspection was still done 'by hand.' Solder seals around vent hole caps offered an hermetic seal, a safeguard against spoilage, and a longer shelf-life.

Several innovations in the canning industry that replaced human labor with machines or 'Iron slaves' (Collins 1924:28) significantly reduced the price of goods and increased company owner profits (Zeide 2019:24). Caps placed over the filler hole were manually 'sealed' by a soldering copper element–a telescoping steel plunger fitted with a circular tip equal to the diameter of the cap was heated in a gas soldering stove or pot or via flexible rubber tubing and a pipe passed through the handle and tip, and quickly fitted over a filled can top and depressed to form a ring seal composed of ca. 45%–55% Lead around the cap, a process known as 'tipping' (Hunziker 1914:118). "A rapid, neat and leakless seal [was] made with this instrument" (Hunziker 1914:101). Mechanized soldering machines used pre-cut bars or wire segments or were automatically fed from a spool which resulted in increased efficiency. Sealed cans were dunked in a hot water test bath while they appertized in order to detect any leakers. Spot seals reduced the amount of Lead necessary to seal the can and were uniform to within a gram (a mere 5 oz. was needed to seal 1,000 cans). Over 90% of cans were filled by this method by 1914 (Hunziker 1914:119). True "hole-in-top" cans featured stamped ends and a pinhole exhaust vent sealed by a drop of solder (Rock 1987:21); the "change-over was completed before 1918" (Rock 1987:47). Matchsticks were not used; machines were.

Sanitary cans

Sanitary cans are distinguished from Gebee- and McDonald-types and vent-hole cans by two 1-piece crimp-sealed can ends and a rolled internal or external side-seam (Figure 8). The first Sanitary cans had a soldered lock-seam body with ends crimped on and hermetically sealed with paper gaskets. Initial results were “not very good” (Hunziker 1914). Cans were deemed “sanitary” because they were made, filled, and sealed entirely by machines. The drawing-and-ironing process perfected in 1963 allowed for cans without side seams (Rock 1987:2), in other words, lead solder was unnecessary.

Key-wind cans

A key-wind method for removing soldered disk closures over filler holes and from the can top was patented on 2 October 1866 by J. Osterhoudt (US58554A). Osterhoudt made sure to indicate how his method did not challenge Moritz Primer’s Letters Patent granted on 28 June 1864 for the use of a wire soldered between the can and cover to assist opening the can (US43378). These early types of key-wind openings were used on sardine cans—similar devices are still used today. A key-wind opening strip was patented in 1892 by John Zimmerman (US486521A–486523A), assignor to the National Key-Opening Can Company of Chicago, Illinois. Edwin Norton adapted a key-wind strip that was incorporated into the base of the body of tapered rectangular processed meat tins in 1895 (US539366A; Rock 1984:105). Norton's Continental Can Company introduced the first vacuum-packed coffee cans featuring a key-wind opening strip marketed by Hills Brothers in 1903. Reclosable friction-lidded key-wind opened coffee cans were introduced in 1920 (Rock 1987:107).

Ribbed cans

G. W. McKim patented a collapsible, telescoping Metallic Cask container (US169824A) granted worldwide on 9 November 1875 that exhibited horizontal beaded rings to prevent damage. Maurice Lachman of Lachman Mfg. Company patented a Cylinder-body

for Containers with beaded rings granted on 31 October 1916 (US1202857A). On 8 December 1936, Charles R. Cooper of San Francisco, California patented a Packing Can "having internal corrugations, ribs or embossments formed in the walls of body of the can to stiffen and strengthen the same against deformation, from either external or internal forces or pressures" that did not preclude paper labeling on the exterior of the can. Vertical, horizontal, and vertical+horizontal corrugations were depicted in the patent diagrams. Indeed,

…where the can may be subjected to external pressure during retorting, or where they remain under high internal vacuum during storage, the cylinder wall may be beaded or ribbed for radial strength. There are many bead designs and arrangements, all of which are attempts to meet certain performance criteria. In essence, circumferential beading produces shorter can segments that are more resistant to paneling (implosion), but such beads reduce the axial load resistance by acting as failure rings. (Robertson 2006:132).

Thompson and Baker (2012:9) found that some gallon-size juice cans exhibited ribs after 1936 and some non-juice cans after 1950. When canners began actively incorporating beaded, ribbed, or otherwise corrugated sanitary cans is still a mystery, but must have been after 1936.

Key-wind ration cans

The Civil War urged the canning industry to produce commodities that could be easily transported to troops; some estimate 5-6 million canned goods were produced. After the Civil War, in 1870, an estimated 30 million cans—approximately 3,000 cans per day—were produced. WWI reinvigorated the canning industry.

A-rations included fresh, frozen, or refrigerated ingredients; B-rations were prepared in the field or served in garrisons that did not have refrigeration or freezer facilities; C-rations

replaced “Iron rations” (1907–1922) and “reserve rations” (1922–1937) which featured key-wind opening strips (Figure 5). “Iron rations,” developed by the British Army, contained three 3-oz. cakes (hardtack), three 1-oz. bars of chocolate, salt, and pepper in a tin packet designed for emergency use by infantrymen. “Reserve rations” contained 12 oz. of bacon or 14 oz. of meat, two 8-oz. cans of hard bread or hardtack, a 1.16-oz. packet of pre-ground coffee, a 2.4-oz. packet of granulated sugar, and a 0.16-oz. packet of salt; a separate ration of rolling tobacco and 10 cigarette papers was later replaced by machine-rolled Lucky Strike-brand cigarettes. In 1922, the ration contained 16 oz. of meat (usually beef jerky), 3 oz. of corned beef or chocolate, 14 oz. of hardtack, coffee, and sugar.

Can opener technologies, types, & diagnostic attributes

Concomitant with can manufacturing is can opener technology. Robert Yates, a cutler and surgical instrument maker, is credited with inventing the first lever-type can opener on 13 July 1855 (Patent No. 1577). However, lever knives for opening tin cases were already known. Indeed, Robert Yates’ father, Frederick Green Yates, registered a patent for a lever-type tin can opener on 26 August 1852 (No. 3356). Samuel J. Hardman and Dr. Andrea Tanner discovered that John Gillon of the John Gillon & Co., Edinburgh, Scotland had developed a claw-type can opener before 1840 (Chambers’ Edinburgh Journal 1840) and diagrams appeared in the Timmins & Sons catalogue ca. 1845 along with a lever-knife-type opener (Hardman 2017:4).

The first U.S. Patent for a can opener (Figure 6) (US19063) was awarded to Ezra J. Warner on 5 January 1858. The design was called a “bayonet and sickle” by users because the shapes of the acting elements resembled a bayonet and a sickle—both of which military personnel could have employed to open sealed cans prior to Warner’s invention; they also might have used axes, chisels, knives, and/or hammers. When Union soldiers did not receive canned goods from the US Sanitary Commission, they obtained them from sutlers who sold

"a wide range of canned goods—canned beef, lobster, blueberries, jams, pickles—that appealed to soldiers who grew tired of their monotonous rations" (Zeide 2019:18).

A can with two small openings on either side of an end or a can with a cut or cuts or punctures on the top can only [have] contained a liquid, such as evaporated milk or cooking oil. Traditional cuts like triangles, crosses [or a] semicircular cut that [was] folded back held food that could not be simply poured out. ... Fruits and vegetables are perhaps the most frequently found ones with partial cutting away of the top or folding it up. By the late 1920's and early 1930's complete removal of the can top became common. (Rock 1987:113)

William W. Lyman received the first U.S. Patents for a cutting wheel to open cans on 12 July 1870 (US 105346A and US105583A). "Lyman's design was difficult to use and was not successful" (Hardman 217:19). Edwin Anderson of Seattle, Washington improved the cutting wheel technology with his Can-Opener patented on 30 November 1920 (Figure 7) (US1360256A). Anderson's innovation featured a hand crank and horizontally cut the circumference of any double-crimped lid rim regardless of shape or size leaving a smooth edge so that the contents of the can could be removed "unbroken" (Western Canner and Packer 1924:48). Also in 1920, Anderson and Star Can Opener Company of San Francisco, California improved the guide roller to grip a double-crimped lid rim more securely (US1528178A and US1598841A). In 1926, Charles Arthur Bunker filed for a can opener patent featuring a geared wheel called a 'freed wheel,' that grips a can rim vertically (US1838525A). In defense of Anderson's patent, the Star Can Opener Co. sued Owen Dyneto Co. (16 F.2d 353, 355) and then the Bunker-Clancey Mfg. Co. (41 F.2d 142) in 1930 for Patent infringement–and lost. Bunker's patent was granted in 1931 and is still in use today as is Anderson's. John T. McGrath of Bloomington, Illinois (the author's hometown)

patented a Reciprocating Knife Can Opener (Figure 8) (US1473306A) on 5 November 1923–a type still in use today in commercial kitchens.

The so-called “church key” container opener was patented in 1933 by Dewitt F. Sampson and John M. Hothersall of ACCO (Figure 9) (US1996550A and US1996551A) before the first cans of beer were filled for sale after Prohibition was lifted in 1934. Operating instructions were depicted on the side panel of flat top beer cans until ca. 1955. This type of opener is still used to open juice cans. Churchkey Can Co. and Churchkey Beer Co. originated in Seattle, Washington in 2012 and re-located to Portland, Oregon in 2015. It has been dubbed the ‘most hipster beer in the world’ (Brown 2012). Pssssht.

The first electric can opener (with a camshaft!) was filed for patent on 16 November 1925 and awarded on 1 December 1931 to Preston C. West of the P.C. West Mfg. Co. of Chicago, Illinois (Figure 10) (US1834563A). The P-38 was designed by U.S. Army Maj. Thomas Dennehy of the Subsistence Research Laboratory in Chicago, Illinois in 1942 (Figure 11) (Foster 2009) and issued to WWII military service members as a convenient and reliable tool to open ration cans. The first U.S. Patent for a “Tin-Box Opener” was granted to French Republic citizen Etienne Marcel Darqué in 1913 (US1082800A). Very similar to the P-38 was also Dewey M. Strengberg's can opener patented on 8 May 1928 (US1669311A). The P-51 improved on the P-38 design by being slightly longer which provided more leverage, yet incorporates and employs the same working element as Yates’ 1855 invention—the lever knife—albeit curved and hinged. One could and still can use a pointed knife to open a can lid.

If *terminus ante* and *post quem* dates, United States Patent and Trademark Office (U.S.P.T.O.) records, and empirically discernable differences or characteristics on opened cans are observed and accepted, then a can opener and opening technology chronology is possible, yet is not ‘clean cut.’ Due to technological overlap and lag, shelf-life, and consumer

habits, cans of various types may have been opened, contents consumed, and subsequently discarded after the production of such a can type ceased. An improved can dating typology and chronology based on the most recently published information, should be treated "as provisional, requiring further field and archival verification" (Simonis 1997) (Table 1).

There are empirically discernable differences between early puncture- or lever-knife-type and mechanical wheel-type openings on cans; mechanical wheel-type openers left a cleaner circumferential cut as opposed to the lever-knife-type jagged edge. A can opened by means of a mechanical wheel-type opener can only have been accomplished after 1920, not before (and not common until after 1935; Rock 1989). Occasionally teeth marks from the gripping wheel are still visible on the can rim. Due to time lag and shelflife, cans of various types may have been opened and consumed after the production of such a can type ceased; can openers were designed for 'lifetime' use with periodic part replacement on some models.

Significance

To qualify for the NRHP, a property must be significant; that is, it must represent a significant part of the history, architecture, archaeology, engineering, or culture of an area, and it must have the characteristics that make it a good representative of properties associated with that aspect of the past—an exemplarist notion (United States 1991:7). Ultimately, the question of integrity is answered by whether or not the property retains the *identity* for which it is significant (United States 1991:45). The answers to the following questions concerning tin cans are useful when attempting to substantiate or provide a basis for significance:

- Can the artifact(s) be located on a current or historic map?
- Are there any historic-era photographs or images of the artifact(s)?
- Can the artifact(s) be located in a book or historic newspaper reference?
- Has/Have the artifact(s) been recorded before either in the same place or a different place?
- Can one determine the manufacture date(s) or date(s) of use?

- Does or Do the artifact(s) have ties to any other known resources, e.g. an historic building or homestead?
- Does or Do the artifact(s) appear to contribute to a broad pattern of history as a contributing element to an historic property such as a Civil War battle field or Emigrant Trail—or is it a single roadside domestic refuse disposal event?
- Is or Are the artifact(s) named after or associated with the land owner who created it?
- Does the resource have a proper name or number?
- Is or Are there any pertinent research question(s) the artifact(s) inspire(s) or potentially answer(s)?

If the answers to some or all of these questions are, yes, then the resource has significance.

Integrity is based on significance within an historic context, i.e. why, where, and when a property is important. Only after significance is fully established can one proceed to the issue of integrity. The evaluation of integrity is oftentimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance. Historic properties either retain integrity; either they convey their significance or they do not. To retain historic integrity a property will always possess several, and usually most, of the aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance—an essentialist notion (United States 1991:44). The seven Aspects of integrity are: Location, Design, Setting, Materials, Workmanship, Feeling, and Association (United States 1991:44–49). The seven aspects are fairly straightforward in definition, yet "integrity is very much in the eye of the beholder, and it is possible to get into some pretty esoteric arguments about whether a place has it or doesn't" (King 1998:67), particularly when justifying or refuting such subjective Aspects as Feeling or Association. Significance and integrity may be and often are more in the eye of the beholder. Ample documentation, substantiation, and justification is necessary; purely personal feelings or

opinions are not valid on their own merit or as *a priori* proof of significance. Case in point, landfills, while potentially worthy of deeper investigation (Humes 2010; Rathje 1977, 1979; Rathje and Murphy 1989) must exhibit exceptional importance if less than 50 years old to be considered eligible for listing (NRB36).

Out of the integrity continuum a conundrum develops: when there are numerous cultural resources of a certain type, some of them can be removed and there is not a significant loss to history or culture; there are still plenty of examples including the best surviving examples. As time progresses and more resources are removed, the preservation community begins to rumble with concerns about impending threats to valuable cultural resources, history, and cultural identity. Soon thereafter integrity becomes a pivotal aspect, and resources that had marginal integrity gain more currency and value because they retain the essence of the past and cultural identity vocal participants in the present wish to see retained for future generations. When there are only a few surviving examples of a certain type of cultural resource, attention towards the identity and integrity the resource exemplifies becomes increasingly important. Depicted another way, the significance continuum looks something like Figure 12. This diagram has the continuum on a vertical not a horizontal axis. This is intentional.

Essentialism is the view that every object (i.e., a whole or fragmentary piece of technology) has a set of attributes that are intrinsic to its identity and function. So long as enough attributes are present that something can be identified as a specific object, its identity may be known. How much is ‘enough’ becomes the issue at hand.

Exemplarism is the condition of being exemplary; the belief that something is beyond the ordinary, unique, outstanding, exotic, and or exceptional. Although exceptionalism or exceptionalist might be better terms to describe outstanding resources, the word has been associated with National Register Criteria exceptions per the National Register Bulletin

Number 15 (NRB15) and should only be used in cases or regarding resources that fit the Criteria of exception (a.) through (g.). Phrases, passages, and text in the NRB15 contain either essentialist, exemplarist, or a combination of both paradigmatic approaches and result in a confounding of the evaluation process when one or more consulting parties holds an opposing viewpoint on a resource or set of resources. The debate may boil down to a more basic conflict wherein in an essentialist perspective: any and all identifiable artifacts, features, sites, isolates, buildings, structures, or objects 50 years old or older is eligible (unless proven otherwise) is counterposed against an exemplarist perspective in which not everything is eligible–only 'good' exemplars of the past justified as significant within an historical context, assessed and found retaining enough aspects of integrity are evaluated as eligible for listing. Exemplary cultural resources are, by their very nature, valued more than ubiquitous, common, or mundane resources. The NRB15 purports to evaluate all resources equally, but a resource will always be somewhere on the exemplarist and essentialist significance continuum.

It may be possible to discern and distinguish between essential and exemplary cultural resources if Capitalism is held as a constant or common denominator (Purser 1999); distinctions among other variables can be compared and discussed at various scales of analysis, too. How do we evaluate real, tangible, material objects and features with an abstract notion? Margaret Purser observed how

> … the archaeological and documentary records of Paradise Valley actually track … the gradual replacement of locally assembled, processed, and maintained consumer goods with goods either more fully processed at distant production centers (like the increasingly processed brand-name foodstuffs of the early twentieth century), or composed of replaceable parts not intended to be either assembled or mended locally (like the vehicles and farm

equipment made increasingly of cast- or stamped-metal components following the 1890s). (Purser 1999:129)

Hence, Purser's example of putting the past in order revealed previously unknown intersections of Capitalist ideology and commodity consumption, i.e. change over time.

Discussion and Conclusions

A search for National Register-listed properties containing tin cans was conducted at www.nps.gov. Zero properties consisting solely of tin cans are listed. A systematic search at the state-level through all 50 State Historic Preservation Offices was not performed due to access issues. A Google search using the terms 'tin cans' and 'NRHP' produced some sundry results and are summarized here.

The Virginia Can Company and S.H. Heironimus Warehouse (NRHP Reference Number 06000067) is listed. The Virginia Can Company was the first and largest manufacturer of tin cans in Roanoke Valley which substantiates its significance; the building complex is extant which also lends to its historicity and listing on the Virginia Landmarks Register.

The Eureka Historic District in Eureka, Nevada contains 18 properties including "homes made of flattened tin cans" among other materials (NRHP Reference Number 073001078). The Ute-Ulay Mine and Mill site (5HN.77) and Hinsdale County Metal Mining Multiple Property Documentation Form (MPDF) includes 24 contributing buildings, seven contributing structures, and one contributing site—Dump 1—which contains whole and fragmentary hole-in-top, hole-in-cap, and Sanitary cans among other historic period artifacts (Horn 2017:31).

The registration form for the F. W. Schmidt House (45TN296) in Olympia, Washington primarily concerns the association of the Schmidt Family with the Olympia

Brewery and Architect Joseph Wohleb's design, yet, curiously, includes a discussion of Mrs. Schmidt's garden, to wit:

> Mrs. Schmidt, an avid gardener, planned the landscaping as well. An elaborate gravity fed system watered the grounds which featured a substantial holly hedge, cutting gardens, birches, fruit trees and an expanse of lawn. The holly hedge was planted in a bed of tin cans, which nourished the hedge from locally grown cuttings. (Stevenson 1994:7)

The El Tiradito "shrine" located within the Barrio Libre National Historic District and the Barrio Historico City Historic Preservation Zone of Tucson, Arizona was listed on the NRHP originally in 1971 (HALS No. AZ-8) and is significant for its association at the local level with the Hispanic community's folklore and folk customs. Based on oral histories, the "shrine" began ca. 1870 as a "mound of earth surrounded by a few candles protected with tin cans" (Steinbrecher 2012:5) and evolved into a U-shaped structural element with a central niche (or *nicho*) with a central recessed arch forming an alcove "where offerings can be placed against the wall," thus indicating a continuing cultural practice (Steinbrecher 2012:2). Cans are no longer used to protect candles from snuffing out.

The railroad siding and settlement known as Milligan, California was first recorded in 1978 (CA-SBR3233H) and contains structural remains and several features. Features contain, among other artifacts, over 50 "key-wind sardine, church-key, knife, and can-opener opened cans, sanitary cans, coffee cans, cone top cans, bi-metal pull-tab cans and modern aluminum sardine cans," (Strauss et al. 2011:33) yet it was the remnants of the siding and the nearby cemetery which were recommended eligible on the California Register of Historical Resources (CRHR) under Criteria 1 and 4 as an individual resource or a contributor to a potential Atchison, Topeka & Santa Fe Railway-Parker Cutoff historic district.

Thomas et al. (2015:44, 58, 76) re-located site Æ-2829-19H (among others) which contained ca. 300 hole-in-top and church-key-opened metal cans among ceramic sherds and glass shards and updated the site record to state that the cans were "[s]older-dot condensed milk cans" and church-key-opened cans. Said site, and several others containing domestic refuse, were not considered "significant to the study of the local or regional history and settlement of this part of the Mojave Desert" under Criterion D.

National Historic Landmark J. S. Lore Oyster House in Solomons, Maryland is classified as an early 20th Century marine commercial structure which curiously contains period equipment including "a collection of oyster cans and shipping containers, a foot-operated canning machine, and an electric double-seamer canning machine from Independent Can Corp., Baltimore, Maryland (which is identical to the original machine leased at this plant by the Continental Canning Company" (Ehelman 1993:6). Clearly the structure and its retained equipment substantiate this property's significance in New England maritime commerce history, not the collection of unused oyster cans and shipping containers.

In 1818, Donkin, Hall, & Gamble produced tins of preserved meats for the 1819 Parry Expedition and the search for the Northwest Passage (Ashworthy 2015; Geoghehan 2013). Postmortems on three frozen bodies of members of the Parry Expedition located on Beechey Island, Canada revealed blood Lead concentrations 29-times the normal. Expedition members suffered from acute Lead poisoning, tuberculosis, pneumonia, anorexia, scurvy, weakness, and paranoia resulting in large part due to acid leaching of incompletely sealed soldered cans (Rowbotham 1987) possibly exacerbated by the month-long 'incubation' period during which cans were kept at 90°C–110°C; others posit that the internal pipe system on the ships is at cause (Geoghehan 2013). Albeit not an NRHP-listed site, the posit that acid leaching of incompletely sealed soldered cans contributed to Lead poisoning among members of the Parry Expedition is significant within an historical context. Nevertheless, a hypothesis

emerges: cans can occasionally constitute contributing elements to historic properties or districts. At the very least, cans are probably the most important chronologically diagnostic artifacts we have in the surviving archaeological record which can aid our efforts in the present to document the past of "a substantial part of the American working class" (Walker 2013:n.p.).

The posit that tin cans can be useful in verifying the age of historic properties related to Emigrant Trails has been raised. The Oregon-California Trails Association Mapping and Marketing Committee published *Mapping Emigrant Trails Manual: Part A: Investigative Procedures & Trail Classifications* (2014) which encourages metal detectorists and remote sensing specialists to assist in the identification of artifacts and features and ranks the reliability of different types of evidence used to verify trail locations, but does not provide guidance on metal artifact types such as tin cans as temporally diagnostic markers.

In 2017 the Northwest Nazarene University (NNU) and Aerial Archaeology Northwest (AAN) completed Unmanned Aircraft Systems (UAS) flights to collect remote orthoimagery to answer two research questions:

1. Are UAS an effective tool to map and record archaeological sites like the Oregon Trail? [and]

2. Can Machine Learning algorithms identify historic artifacts, and linear features directly from the UAS imagery? (Calkins 2018:9).

The methods were tested at the Owyhee County Can site and the results were that the algorithm "accurately identified the tin cans on the images" and in subsequent tests (Calkins 2018:10). Further tests were planned in 2018 to identify other material and feature types related to wagon trails. Although these results are preliminary and not widely tested, there exists a real possibility that historic wagon routes can be identified and corroborating evidence such as chronologically diagnostic tin cans can assist in the accurate dating of such

features and sites. Less charismatic yet still significant local-level historic period wagon routes might benefit from increased attention to temporally diagnostic debris scatters. Wayside camp sites may provide enough artifactual evidence to discern and distinguish an historic period wagon road from a modern off-road vehicle (ORV) road on public land even if the road is and has been used for modern recreation.

Suffice it to say, no isolate, scatter, or concentration of tin cans was found eligible for listing on the NRHP on its own merit in this archival survey, yet the possibility still exists. Further, not all state databases of archaeological records were searched in this paper; there might be sites associated with battlefields, military training camps, emigrant camps and roads, as well as canning factories that exist or have not yet been located, recorded, assessed, evaluated, and recommended eligible for listing on local, state, tribal, or national historic preservation registers. The UAS experiments conducted by NNU and AAN present possibilities for locating sites that would otherwise be obscured or illegible to the naked eye at the ground level. Metal detectorists could also benefit the search for early food cans; 'bottle pickers' might also find interest in cans. But without an historic context statement, the significance of cans cannot be advocated much less recommended as eligible for listing on a register. More research is needed to promulgate and promote cans' potential. And last but not least–it is inadvisable to categorically deny or dismiss all corrugated cans as non-historic; some corrugated cans are 50 years old or older and qualify as historic period artifacts worthy of recordation. Do your due diligence.

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LIST OF FIGURE CAPTIONS

TABLE 1

CAN TYPES, MANUFACTURE DATE RANGES, AND REFERENCES

TYPE	MANUFACTURE DATE RANGE	REFERENCE
Gebee	after 1904–before 1918	Hunziker 1914:76; Bitting 1937; Rock 1987:47
McDonald	after 1904–before 1918	Hunziker 1914:76, 98–99; Rock 1987:47
Hole and cap hand-soldered	ca. 1810–1850s	Merritt 2014:5; Rock 1988:12–13
Hole and cap machine-soldered	after 1880–before 1918 (rare after 1905)	Gillio 1980; Rock 1984:103
Vent hole, a.k.a. "hole-in-cap"	after 1823–before 1918	Rock 1987:4; Rock 1988:21, 49
Hole-in-top soldered cap condensed milk	after 1875–1914	Merritt 2014:6; Rock 1988:12
Condensed milk hand-soldered seams	1875-1903	
Condensed milk crimped seams	after 1904–present	
Vent hole	ca. 1900–ca. 1985	Rock 1988:21, 49
PUNCH HERE embossed on bottom	1935–1945	University of Utah 2001:471
For chronologies of evaporated milk cans see Reno (2012) and Simonis (1997)		
Stamped end	1840s–1985	Rock 1988:20, 49
Overlapping side seam	ca. 1840–1900s	Rock 1988:4
Internal folded side seam	1859–1890s	Rock 1988:5
improved with gasket	1890s–???	Rock 1988:5
Internal rolled side seam	1888–1993	Rock 1988:6
Sanitary (stamped)	1904–1908	Rock 1988:12, 22; Sutton and Arkush 2002:168
Sanitary (general)	1908–present	Rock 1988:12, 22; Sutton and Arkush 2002:168
Threaded can	1860s–1890s	Rock 1988:17
New products-spice, tea	1890s–1920s	Rock 1988:17
Other products-varnish, etc.	???–1993	Rock 1988:83
Knurled cap	ca. 1924–1993	Lief 1965:29
Key-wind top strip with overlapping side seam	1860s–1900s	Rock 1988:65
Key-wind top strip-drawn	ca. 1897–1993	Rock 1988:66
Key-wind top strip-meat	ca. 1890–1993	Rock 1988:62–63
Key-wind top strip-coffee, vacuum packed	ca. 1903–1960s	Rock 1988:32, 40–42
External friction lid	1880s–1993	Rock 1988:85
Ration	1907–1970s	
Ribbed	after 1936 (juice cans); after 1950 (non-juice cans)	Thompson and Baker 2012:9
Quart-size oil can	after 1933	Sutton and Arkush 2002:169


ORIGINAL
DEVILED
HAM
UNDERWOOD
BOSTON
MASS.
ALL OUR OTHER CANNED PRODUCTS
ARE PREPARED WITH EQUAL CARE
Wm. Underwood

(No Model.)

M. AMS.

SHEET METAL CAN.

No. 570,591. Patented Nov. 3, 1896.

FIG. 1.

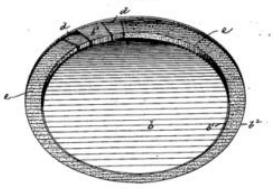


FIG. 2.

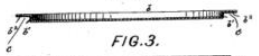


FIG. 3.

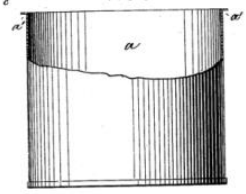


FIG. 4.

FIG. 5.

FIG. 6.

Witnesses:
John Becker.
Willie Miller.

FIG. 7.

Inventor:
Max Ams
by his attorneys
Rader & Briesen

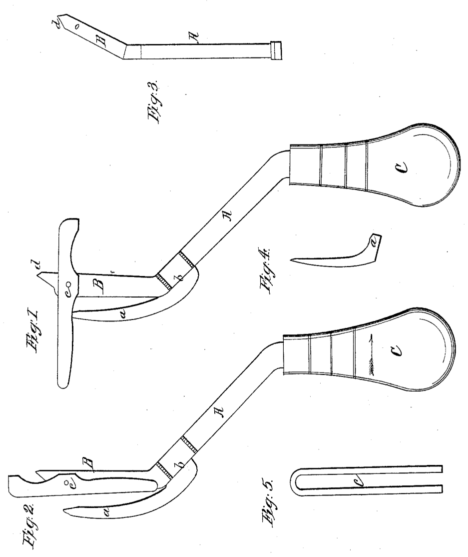
Fig. 23. The solder seal [1]

Fig. 25. The Sanitary can [1]

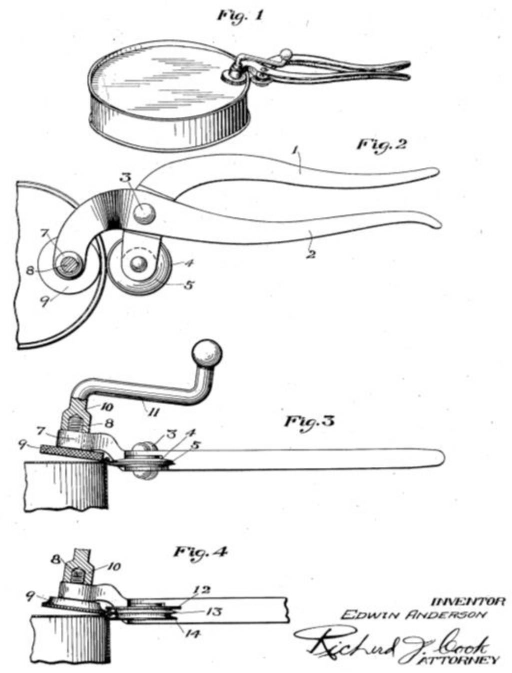
Fig. 24. The Gebee seal

Fig. 26. The McDonald seal [1]

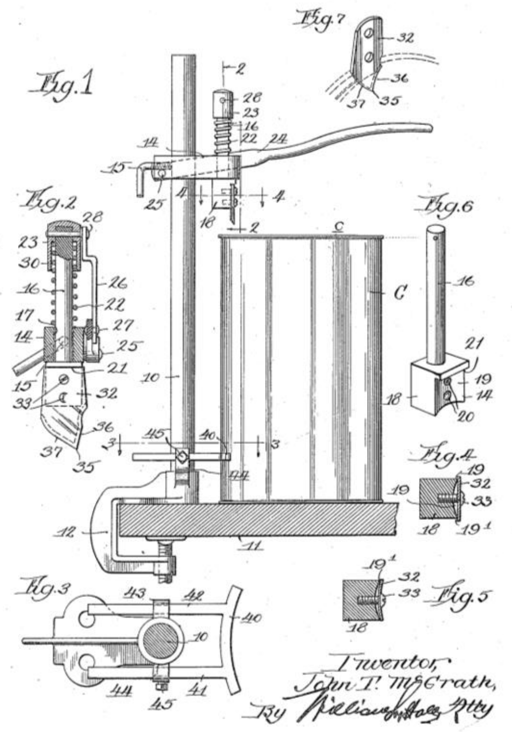
E. J. Warner,
Can Opener,
№ 19,063. Patented Jan. 5, 1858.



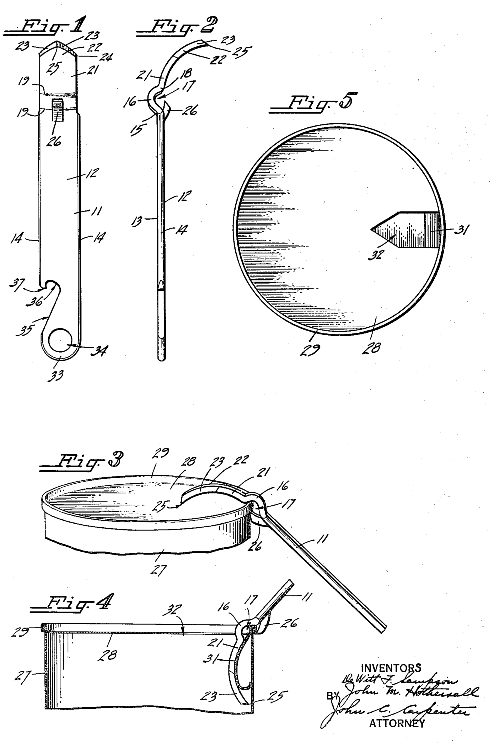
E. ANDERSON.
CAN OPENER.
APPLICATION FILED APR. 20, 1920.
1,360,256. Patented Nov. 30, 1920.

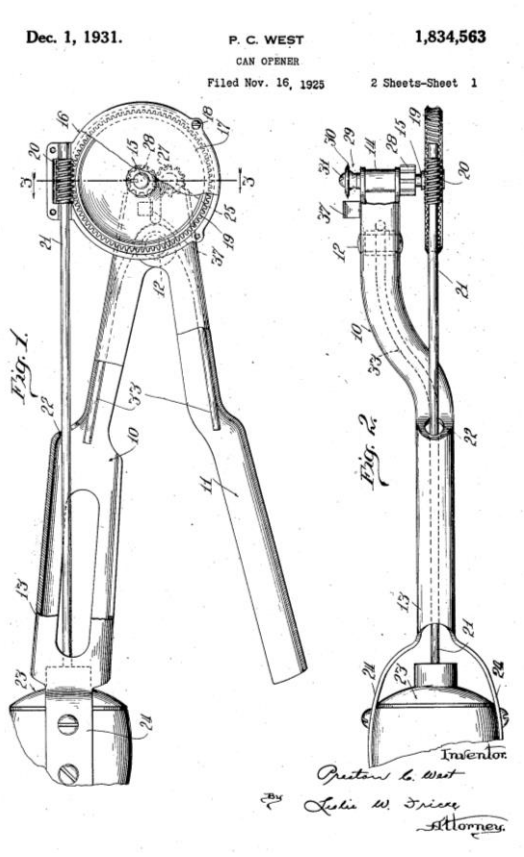


Nov. 6, 1923. J. T. McGRATH 1,473,306
RECIPROCATING KNIFE CAN OPENER
Filed Aug. 6, 1921

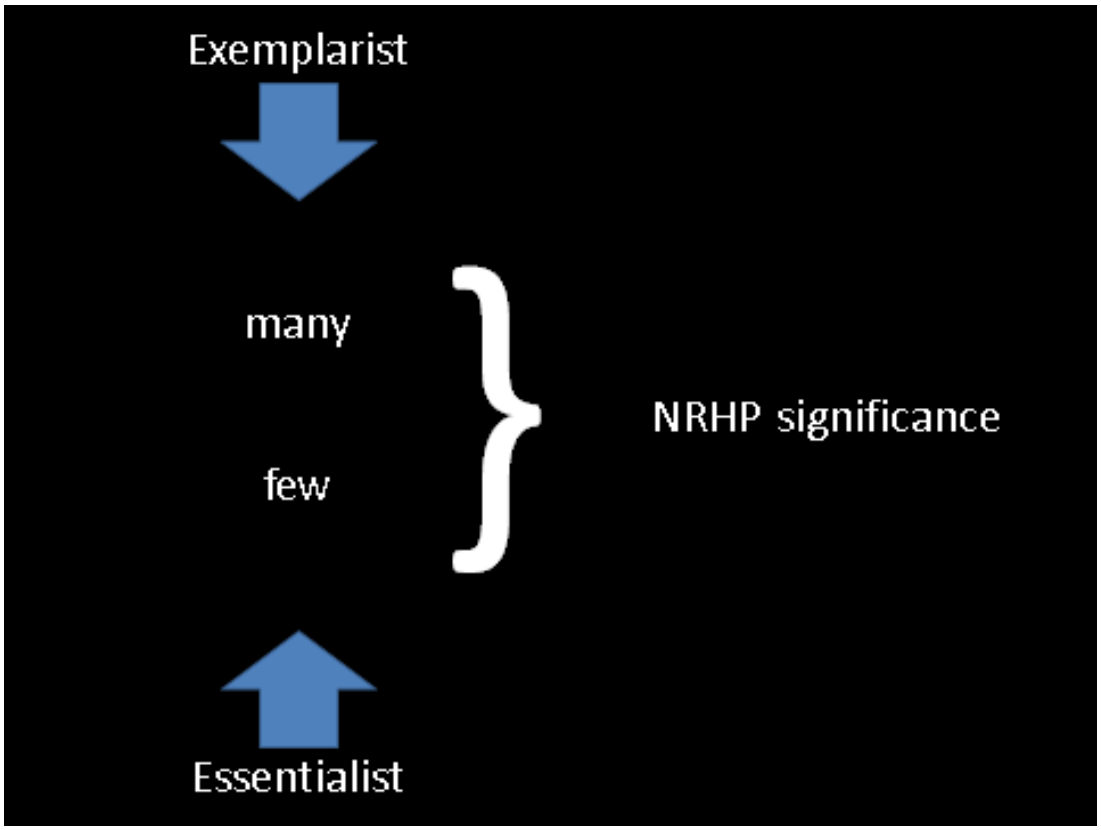


April 2, 1935. D. F. SAMPSON ET AL 1,996,550
CONTAINER OPENER
Filed April 13, 1933




Dec. 1, 1931.
P. C. WEST
1,834,563
CAN OPENER
Filed Nov. 16, 1925
2 Sheets-Sheet 1
Fig. 1.
Fig. 2.
Inventor
Gustave C. West
By Leslie W. Price
Attorney.


G.G. GREENE
Warren, Pa., U.S.A.
CAN OPENER


Exemplarist
many
few
NRHP significance
Essentialist