THE TUBE COUNCIL

A self portrait shows John Goffe Rand, New Hampshire born artist who invented the collapsible metal tube which has become so useful today. Almost forgotten for his art, Rand earned a place in history for his invention

The Irrepressible Collapsible Metal Tube

By:

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Millions of Americans perform a twice-a-day ritual that's virtually automatic. In the morning, and again at night, they meticulously brush their teeth, a routine that annually uses up more than a half-billion tubes of toothpaste of varying sizes.

Times and tubes have changed since Rand gathered madel at top. First wide use of metal tubes came In 1892 when a New London' Conn. dentist packaged toothpaste in tubes rather than In Jars. Today's tubes (bottom) contain all kinds of paste-like products

Had these same Americans been living in the latter half of the nineteenth century their acquaintance with a dentifrice not only would have been infrequent-it was a luxury enjoyed by a fastidious few-but it also would have been unsanitary. At that time toothpaste was packaged in porcelain jars. One simply dipped a toothbrush into the paste and took what was needed. So, too, did other family members.

Then, in 1892, a New London, Conn., dentist, Dr. Washington Wentworth Sheffield, had an idea. Why not package the toothpaste he dispensed in a collapsible metal tube? Such a container, he reasoned, was both convenient and sanitary. All one needed to do would be to squeeze out the desired amount of paste and, as the contents were used, the tube could be rolled up. The air-tight tube also would keep the paste from drying out.

The late AUGUST HERMAN WIRZ founder of the collapsible squeeze tube industry in the United States after a visit to Vienna

Dr. Sheffield's Creme Dentifrice was an immediate success. Collapsible tube packaging lowered the price of toothpaste and spawned the U.S. dentifrice industry that now accounts for $150 million annually in retail sales. It provided the collapsible squeeze tube industry, then on the American scene a little more than a score of years, with the impetus it needed to lift it out of the packaging doldrums.

Today, in a consumer-oriented economy that. is witnessing increasing emphasis on convenience packaging, the collapsible squeeze tube industry is a $40 million business. Small in comparison to the industries that produce cans, glass containers and folding paper boxes, it nevertheless commands unique respect in the multi-billion dollar packaging field.

The U.S Collapsible Tube Industry		
Year Founded	**Company**	**Plants**
1836*	A.H. Wirz, Inc.	Chester, Pa. & Carrollton, Ky.
1898	Turner Tube Corp	New Brunswick, NJ
1900	Sheffield Tube Corp.	New London, Conn.
1902	Standard Collapsible Tube Co.	Rochester, Pa.
1904	Peerless Tube Co.	Bloomfield, NJ
1910	Wheeling Stamping Co.	Wheeling, W. Va.
1913	White Metal Mfg. Co.	Hoboken, NJ
1919	Victor Metal Products, Inc. National Collapsible Tube Co.	Newport Ark, & Chico, Calif. Providence, RI
1920	Atlantic Manufacturing Co. Aluminum Co. of America	Newark, NJ Edgewater, NJ
1922	Atlas Collapsible Tube Co.	Chicago, Ill
1924	Sun Tube Corp.	Hillside & Washington, NJ
1927	Art Tube Co.	Irvington, NJ
1932	Michigan Collapsible Tube Co.	East Detroit, Mich.
1947	Metal Container Corp.	Indianapolis, Ind.
*Began the manufacture of metal tubes in 1870		

The late GUSTAV RICHTER who put collapsible tube manufacturing on a mechanical basis in its early years in the U.S.

The metal tube's pre-eminent position is due to its unique qualities and characteristics: it is non-porous, light in weight, sanitary, durable, versatile, non-refillable, decorative, easy to handle, has a long shelf life and is adaptable to modern mass production methods and to automatic packaging.

It is thus eminently suited for dispensing, in easily controlled portions, medicinals and pharmaceuticals, cosmetics, shaving creams, dentifrices, spread-type food products, and household and industrial items such as lubricants, adhesives and similar products.

More than 40 standard sizes of tubes are available in sizes ranging in diameter from 3/8 to 2 inches, in length from 2 to 10 inches and in capacity from 3/4 dram to 16 ounces in aluminum, lead, tin, tin-coated lead and tin-lead alloy. Product compatibility largely determines the type of metal to be employed.

The late R. L. KENAH, for years dean of the industry, who influenced its steady development in many ways

The tube-making process usually begins with billets of metal which are melted, molded into slabs rolled to proper thickness, and punched into slugs or blanks of pre-determined size. With soft metals, it is also possible to cast slugs. The slugs are extruded under high pressure. During the extrusion process the cold plastic deformation of the metal is accomplished when the metal fills the die cavity and the excess flows up over the straight sides of the cylindrical punch. This results in a one-piece, seamless, hollow tube with a plain or embossed shoulder and neck at one end and open at the other for filling. The tube may or may not have an aperture at this point. It is then trimmed to desired length, the neck threaded and faced, and, if aluminum, annealed at temperatures between 900*F, and 1200*F.

Decorated Tubes

If tubes are to be decorated-and most are-a base coating of enamel is applied, the tubes run through a drying oven, and, while the coating is still tacky, the decorative inks and printing in one to four colors are put on by offset lithography. Occasionally an external coat of clear lacquer, which enhances the lithography, is added as a protection against products known to attack inks and as a moisture barrier.

The late ARCHIBALD W. PAULL Sr., responsible for a number of mechanical advancements in collapsible tube manufacturing

The collapsible metal tube, or the "compressible" tube, as it was sometimes called, had been around for quite a few years before Dr. Sheffield's historic experiment. In fact, it was in 1841 that John Goffe Rand extruded the first tube of tin to hold artist's oil colors.

Rand was an American portrait painter of considerable stature. A protege of Samuel F. B. Morse, inventor of the telegraph and a famous artist himself, Rand also had an inventive mind. When he went from his birthplace in Bedford, N.H., to Boston to study painting, his principal occupation-so it seemed to him-was the grinding of paint pigments for his teacher.

This chore irked Rand. Like other artists of his day, he had to grind the pigments and mix them in oil as they were needed. If any colors remained, they were put in "skin" bags made of animal bladder. The usual practice was to squeeze the colors through an opening made with a "spike" a bone stopper that also was used to plug the opening to prevent the colors from oxidizing.

Rand finally found what he wanted a "metallic vessel so constructed," his patent application states, "as to collapse with slight pressure and thus force out the paint or fluid confined therein through proper openings for that purpose and which openings may be afterward closed air-tight, and thus preserving the paint or other fluid remaining in the vessel from being injuriously acted on by the atmosphere."

The late JOHN STROUD TURNER a hardy pioneer of the tube industry who contributed much to its development

Rand was residing in England when he patented his tube in that country and in the United States. He took out a patent (No. 8863) March 4, 1841 in London and registered his final specification six months later on September 4th. On September 11th, he received U.S. Patent No. 2252. While Rand referred to the tubes as being made of "drawn thin tin," he did not give any manufacturing details. In fact, the first collapsible tubes resembled the single-unit or "one-shot" tubes of today in that they lacked the familiar shoulder, neck and cap.

They were simply hollow cylinders with both ends open. Either end could be closed with pincers or with metal solder. To extract the colorants, it was necessary to perforate the tube.

When Rand registered his second British patent (No. 9480) on September 29th, 1842, he had improved considerably on his original idea. He now gave full details for the extrusion of tubes from flat discs, explaining that these could be pressed with nozzles attached complete and that the shoulders of the tubes could be stamped with words or names in one operation. One of these early tubes is now in the possession of a descendant, Mrs. I. D. Anglemyer of Washington, D.C. A third British patent (No. 9703) was granted to Rand on August 7, 1844, but this was for an alternative method of manufacture and improvements in tool design and did not supersede or

alter the former patents.

Evidence is lacking as to whether Rand first manufactured tubes or arranged for this to be done by others. Artist colors are known to have been packaged in tubes in England prior to 1845 Reeves & Son, Rowney & Co., and Robertson & Co., have substantiating handbills, circulars and price lists. Rand was listed in the London postoffice directories from 1841 to 1848 only as an artist. In the latter year, he formed John Rand & Co., at 24A Cardington St., Hampstead Road, describing the firm as "patent collapsible tube manufacturers" and makers of "Aeolian pianoforte actions and stringed or wired instruments."

How Rand acquired the necessary capital to establish such a widely divergent manufacturing operation as collapsible metal tubes and pianoforte actions still remains a mystery. It may well have been his own. When he went to England in 1836 with his Charleston, S.C. bride, it was to further the study of painting. While he acquired somewhat of a reputation as a portrait artist by this time, his funds were meager in London, and for a time at least he had few calls for his services. His star began to rise when it was learned that he was an intimate friend of William Cullen Bryant, the rising young American poet, and soon orders began to pour in from the nobility and in time even from the royal family. The money he derived from these "sittings" might well have provided the funds he needed to venture into business. A resume of Rand's life, written by a member of the Rand family some years after the artist's death, states that he had formed a partnership with a Sir John Carr, but evidence on this point also is lacking. The only Sir John Carr at that time was a barrister and, if a partnership existed, it has not come to light.

The late GEORGE H. NEIDLINGER credited with developing the decorated tube and the molded plastic cap

From a commercial standpoint the collapsible metal tube was an immediate success. American firms manufacturing artist colors soon began to import the containers, failing to heed the admonition of an American art magazine editor that the tube was only a passing fancy. Rand stood to realize a sizeable gain from his unique invention, but the money it brought him went toward another of his inventions and he lost heavily. This was a device to be attached to the piano to produce organ-like tones. It ultimately proved a failure. To satisfy creditors, Rand disposed of his British rights in the tube.

Wirz the U.S. Pioneer

As a package that does just more than serve as a package the wonder of it is that it took so long for

Americans to discover the metal tube's potentialities. It was not until 1870 that their manufacture was attempted in this country. Meanwhile, in France, M. Richard began making tubes between 1850 and 1854 on a hand-operated screw press, the first to do so on the European continent. The tubes were exhibited at the Exposition Universalle de Paris in 1855 and won for Richard an award signed by Napoleon III. The award, the press and some of Richard's first tubes are still in the possession of Krieg & Zivy, successor to the Richard firm and, next to H. G. Sanders & Co. of London, the oldest company now fabricating tubes.

Rand is said to have returned to the United States in 1848, although the London firm bearing his name continued in business until 1868. Whether from the reverses he suffered abroad, or the losses he incurred in fighting French infringements on his patents, he never could be interested in producing tubes in this country. It remained for August Herman Wirz, a Philadelphia manufacturer of surgical instruments and metal specialties, to begin their manufacture here.

COL. STANLEY RUMBOUGH, chairman of the board of White Metal Mfg. Co. and former president of the industry's association

The A. H. Wirz firm, still in business and now located in Chester, Pa., was founded in 1836. In 1870, three years before Rand's death in New York city, Mr. Wirz went to Vienna as the U.S. Commissioner to the industrial exposition being held in that city. There he saw metal tubes being made on the newly-invented hydraulic press and visualized their commercial possibilities for products other than artist colors. He brought back plans for the machine and a German tool and die maker to build it and added tube-making to his business. This phase of operations soon became so profitable that, by 1885, the manufacture of surgical instruments was discontinued. Wirz was the first to package a cosmetic preparation in a collapsible metal tube, a product known as Evans' cucumber jelly. In 1914 the firm outgrew its quarters in downtown Philadelphia and moved to Chester, Pa. That same year H. S. (Zip) Darlington joined the company, beginning a 40-year tenure that was marked by his elevation to the presidency in 1929. Mr. Darlington retired in 1954 and was succeeded by Mark K. Dresden who held the post until his resignation in September 1958. Robert F. Cox now heads the firm.

THEODORE W. SCHMITT, executive vice president of Peerless Tube Co. and second President of the Collapsible Tube Mfrs. Council

Prior to 1900 the U.S. had only three tube manufacturing concerns. The second to enter the picture was the Consolidated Fruit Jar Co. of New Brunswick, N.J. This was in 1880, a year which saw the introduction of the first crank-type extrusion press, the work of Wirz's John Rausch. Consolidated's chief interest, then as now, was the production of bottle caps. Collapsible tube manufacture was more or less a sideline, and as the

industry began expanding after the turn of the century, it became less and less a factor in Consolidated's business. Finally, around 1938, Consolidated discontinued tube production.

A weather beaten tombstone in New York City's Woodlawn cemetery marks the grave of John Goffe Rand, inventor of the tube in 1841.

The third U.S. tube plant was the J. S. Turner White Metal Co. of New Brunswick, N.J. It was established in 1898 by John Stroud Turner, who still in his teens, emigranted to the United States from England. Turner learned the art of tube-making as an employee of the Consolidated Fruit Jar Co. When he set up his own business, the J. S. Turner White Metal Co. the assumption is that "white metal" referred to tin-it was in his own home. His first customer was Johnson & Johnson, located in the same city, and the Turner firm, now headed by the third generation with J. E. Turner, Jr. as president, still makes tubes for various J&J products. In 1958 the name was changed to Turner Tube Corp.

From its very beginning the Turner firm was constantly on the alert to advance the art of tube manufacture. J. S. Turner was one of the first to experiment with cellulose as a raw material and one of the first to inquire into the possibilities of aluminum as a tube metal in this country. In fact, two years before his death in 1922, he went to Switzerland to buy machinery for this purpose, but he

abandoned the idea. This was at a time when the Aluminum Company of America was preparing to join the tube manufacturing ranks.

Toothpaste and Growing Pains

What brought the collapsible metal tube industry into prominence and gave this container the recognition it so badly needed and justly deserved was, of course, toothpaste. Dr. Sheffield, one of the foremost dentists of his day, got the idea from the packaging in Europe of a food product in a metal tube. If paste-like foods could be put up in tubes, then toothpaste could be similarly packaged. With metal tubes imported from Europe, principally from Soissons, France, Dr. Sheffield's toothpaste soon was finding its way through the western hemisphere as well as other parts of the world. There was even a London agent, Miller, McLane & Co., and advertisements-not the first for a dentifrice-appeared in the Youth's Companion and Everybody's magazine extolling the benefits of the toothpaste in the new-type container. New London became a leading toothpaste manufacturing center. Dr. Sheffield not only made and sold his own product, but he packaged toothpaste for Beacham that was sold the world over in conjunction with the English firm's famous pills.

SETH MALBY whose vision prompted Alcoa to enter in the manufacture of aluminum collapsible tubes in the United States after World War I

Toothpaste's only competitors of any consequence at the time were a red liquid called Sozodent, which was 37 per cent alcohol, and Dr. I. W. Lyon's tooth powder, still available today. Dr. Lyon's tin can with a "telescopic measuring tube" was a revolutionary package when it was introduced in 1891, but the packaging of toothpastes by Dr. Sheffield in metal tubes soon forced Sozodent out of existence and cut heavily into sales of the powdered product. Sheffield's sales went up so fast that they bought a machine to make their own tubes and then established a plant to make them for other dentifrice purveyors. The manufacture of tubes soon overshadowed that of toothpaste to such an extent that, in 1900, the New England Collapsible Tube Co., now the Sheffield Tube Corp. was established. It is now headed by L. Tracy Sheffield.

The late R. V. (REG) ELLIOTT of Alcoa who died shortly before retirement in 1958 who aided in the development of aluminum tubes

The metal tube virtually turned the dentifrice business into the toothpaste business. Its success prompted others to enter the field. The most notable was Colgate & Co. With its world-wide set-up for soaps, perfumes and other products, it did more than any other to hammer home the importance of brushing the teeth regularly. Colgate had been making a dentifrice in paste, powder and cake form since 1873. Only after it turned to the use of tubes in 1896

(years later Gilbert Colgate told W. Kyle Sheffield executive vice president of the Sheffield firm, that the New London company supplied the idea) did it enjoy marked success.

So well did Colgate exploit the new package over the years that it became the world's largest manufacturer of toothpaste. As Modern Packaging reported in 1949 in naming Colgate's Ribbon Dental Cream for Packagings' Hall of Fame: "Not only has Colgate become a leader in packaging, but along the way it has developed techniques in advertising and promotion that have become classics of mass merchandising." Millions of dollars were poured into these efforts. Compelling slogans intrigued the public and some of the best were tied to packaging improvements. "We couldn't improve the product, so we improved the tube!" Colgate boasted in introducing the famous ribbon opening in 1908. The "Aromatic Tooth Paste" became "Colgate's Ribbon Dental Cream" a descriptive phrase still used today even though the metal tube no longer has a ribbon openingand for years every tube and every carton glowingly stated: "Comes out a ribbon lies flat on the brush."

THEODORE REED, president of Standard Collapsible Tube Co. whose company Introduced the stip tube

Colgate's toothpaste tubes were the first to make use of lithography, a European development. When the paste was first marketed in tubes of pure tin the containers had paste-on labels and a clipped fold at the base.

The tubes were imported from Metalindustrie Richter A.G. in Pforzheim, Germany, which was established by Gustav Richter and still is in existence at Karlsruhe, the largest tube manufacturer in that country. In 1896 Richter, who had learned the mechanics of collapsible tube manufacture in France under M. Richard and was the first to mechanize production in Europe, introduced the enameled tube. Colgate was quick to seize on the merchandising possibilities of one-color decorated tubes. At first, the color was applied by hand with a brush. Quick drying lacquer colors were used and the tubes revolved on a machine that made the decorating process semi-automatic. In 1901, Richter developed a fully automatic lithographic process, using rubber rollers and plates.

JOSEPH H. HEIDIGER, vice president of Standard Collapsible Tube Co. who has specialized In sales development for many years

Lithographing a Major Advance

Automatic lithographing represented a major advance. Coupled with the success of toothpaste in tubes, and the possibilities it held for tube-packaging of other paste-like products, it attracted others into the industry. One was David H. Wortendyke, a wholesale grocer of Paterson,

N.J. Another was George H. Neidlinger, one of the industry's colorful personalities in its early days. Both incorporated their firms in New York City.

Wortendyke started out in 1902, but two years later he disposed of the business to R. L. Kenah, then a manufacturer of stationary gasoline engines and special machinery in New Brighton, Pa., and the Standard Specialty & Tube Co., now the Standard Collapsible Tube Co. of Rochester, Pa., came into being. Neidlinger was a dealer in druggist's sundries when he organized the Peerless Tube Co. on July 30, 1904, to "manufacture, buy and sell, print, lithograph and color, close and fill" collapsible metal tubes. Which of these two companies was the first to decorate tubes in this country is a matter of argument. An early Standard brochure claims that "We are the original manufacturers of colored and printed collapsible tubes in America." Neidlinger bought tubes from American manufacturers and decorated them on a machine he obtained in Germany. The early one-color lithographing machines consisted of a flat rubber plate and a mandrel on which the tubes were placed. The base coat was applied with a brush while the tube revolved and then rolled across the rubber plate. The tubes then were placed on "pins" to dry.

L. TRACY SHEFFIELD, president of the Sheffield Tube Co., son of the founder, Is also chairman of a New England bank

The contributions of both Standard and Peerless to the art of tube lithography in these early years did a great deal to increase the container's acceptance as a package. From one color the number grew to four and five with designs skillfully executed with the decorative art then in vogue. Standard printed tubes in five colors, including the base coat, as early as 1912, and in the same year Neidlinger was granted a patent (the patent was applied for in 1909) on a multi-colored tube printing press. Peerless, which moved to Bloomfield, N.J., in 1912, also was the first to reproduce a complete halftone photograph on a tube.

STANLEY RUMBOUGH Jr. president of the Metal Container Corp. former assistant to the Secretary of Commerce of the U. S. A.

Both Standard and Peerless were pioneers in other phases of collapsible tube manufacture. In 1909, Standard introduced what it called the "stip" tube a tube with an elongated tip that was an early development of the ophthalmic or eye-tip tube. Standard was one of the first to make, if indeed it was not the originator of, tubes with "captive" caps. These, like others that followed, never were completely successful. An enormous number of man hours and a great deal of money have been expended to capitalize on the illusive mirage of a tube with an ideal captive cap. Even today efforts are being made to revive interest in such tubes, but the containers are either functionally impractical or excessive in cost. Moreover, the approach has been psychological rather than practical. Standard's "No-Cap" tube was made with a steel spring clip. A quarter turn of the cap exposed a vertical ribbon

orifice in the tube's neck. There was only one fault: the tube's contents kept clogging the orifice.

Standard also was one of the first Atlantic Manufacturing Co. was another to experiment with a "tube within a tube," a conventional tube inside of which was a second tube. The outer tube contained toothpaste, the inner tube a coloring agent. The lower half of the inner tube fitted snugly into the outer tube with the upper portion having half the diameter of the lower part. Each tube had a neck but a common cap.

HUBERT RICHTER, president of White Metal Mfg. Co. which helped to develop the automatic capping and lacquering machine

Peerless' advancements have been concerned not so much with the tube itself as with machinery and materials. When plastics were beginning to prove their wide utility in the early twenties, Neidlinger turned to them as a material to replace metal caps. It was at his suggestion that the Boonton (N.J.) Molding Co., produced caps of a phenolic material. At approximately the same time, Mack Molding Co. of Wayne, N.J., and Colt's Patent Fire Arms Co. of Hartford, Conn., became interested in this challenging problem. Like so many other industry developments, the first use of plastic caps is open to questions, but it is generally acknowledged that the honor belongs to E. R. Squibb & Sons. Peerless supplied the caps. Slow to take hold, caps of plastic virtually have eliminated metal caps due to their lower cost, greater eye appeal, and, in the case of polyethylene, a superior seal. Phenolics long since have been supplemented as a cap material by urea and polyethylene.

Another Peerless development of significance, and one which will be discussed later, was an improved machine for internal waxing of tubes. Internal coatings are extremely important because of the broad range of products packaged in collapsible metal tubes. Product contamination by the metal, and in certain cases, of product attack on the metal itself, must be scrupulously avoided.

FREDERIC REMINGTON, president of Peerless Tube Co. which developed an improved machine for coating collapsible tubes internally

Early Plastic Coatings

The contributions of W. Kedzie Teller, now executive vice president of Pharma-Craft Corp., had much to do with putting the industry on the right path with regard to internal coatings. Teller became interested in the problem in 1932 when Pharma-Craft began packaging experimentally an anti-perspirant cream in metal tubes and encountered a seepage problem at the crimped end of the container that was solved temporarily by dipping in latex. Later, Teller developed an attachment for filling machines that sprayed

wax into the lower area of tubes to prevent seepage. This work provided the impetus for research that ultimately led to the complete coverage of the entire interior surface of metal tubes.

Teller also was responsible for another important contribution to tube technology-the development of a thermoplastic adhesive for cementing cap liners. In the 1930's liners were made of paper-coated composition, cork, or similar material, and glued into bakelite caps, then growing in use. When the caps were unscrewed, however, the liners often stuck to the mouth of the tube. Teller's adhesive solved this irritating problem and he gave the formula to both Wirz and Atlas Collapsible Tube Co.

ARCHIBALD W. PAULL of Wheeling Stamping Co. which Is the only company to cast the slugs or blanks from which tubes are extruded.

Prior to 1910 the U.S. collapsible squeeze tube industry comprised six companies. That year Wheeling Stamping Co. of Wheeling, W.Va., came on the scene. Established in 1877 by Archibald W. Paull, and now in the hands of the third generation of the family, Wheeling for many years was a leading manufacturer of kerosene lanterns and lamps, automobile headlight burners and hub caps, catsup bottle tops and other metal stampings. One of the larger of the industry's 13 tube companies, its production activities are now confined almost exclusively to metal tubes. Wheeling over the years has been responsible for a number of advancements. One of the few to mold caps, it was the first to develop means for applying these automatically. It also was the first to use drying conveyors in the decoration of tubes and is the only company to cast the slugs or blanks from which tubes are extruded. Its claims to have been the first to use compressed air to remove tubes from extrusion presses was disputed in 1920 by Wirz, but Wheeling nevertheless was granted a patent on this innovation.

In the last couple of years Wheeling has come up with two new developments. It re-introduced the white plastic neck which had been used on tubes of a British toothpaste sold in this country some years ago and made by Peerless. The machine for applying and fastening this plastic neck to a metal collapsible tube was patented by Peerless in 1947. Wheeling's plastic neck for Crest toothpaste is a modification, the first to be employed for an American-made product. Of white urea, it is molded and applied to the tube on special-purpose multi-spindle trimming machines developed by the company. Wirz also began producing the plastic necks for Crest shortly after Wheeling entered the picture. In 1956, Wheeling substituted polyethylene for the conventional metal tip of ophthalmic tubes, making it an integral part of the container. Tips of plastic materials had been in use as applicators, but as separate units. The principal advantage claimed for the polyethylene-tip is that it provides a clean,

soft applicator.

J. E. TURNER Jr. president Turner Tube Corp. represents the third generation In the direction of the company since It was founded.

Period of Growth

Up to this time all of the U.S. tube companies were American-owned and operated. In 1913, at Colgate's invitation, its French and German sources for tubes set up the White Metal Manufacturing Co. in Hoboken, N.J. Colgate had been importing tubes from the Richter firm in Germany, but in 1900 it added a second supplier, Krieg & Zivy of Montrouge, France, which had absorbed a French branch of the German Richter firm and formed in Nancy a company known as the Societe des Anciens Etablissements G. Richter. Colgate's move for adequate supply sources in this country, even though the lithographing of tubes had reached a point here comparable to that in Europe, was prompted by the threat of war abroad. Thus it was that Hubert Richter, Carl Kleinbeck and Fritz Ruckert arrived from Germany to organize White Metal. They were joined later by Frederick Rentschler, general manager of the Krieg & Zivy plant in Nancy and developer of the tin-coated lead tube. When the United States entered World War I in 1917 the company was seized by the Alien Property Custodian and its facilities later put on the auction block. White Metal was reorganized in 1919 with American stockholders. Col. Stanley M. Rumbough became president and Hubert Richter, son of Gustav Richter, was made vice president. They are now, respectively, chairman of the board and president.

ROBERT F. COX, president of A. H. Wirz Co. Inc. represents the fourth generation of the Wirz family in the company

White Metal always has specialized in mass production techniques and was the first to purchase and help develop the now widely-used horizontal Herlan press, and it contributed to the development of the combination automatic capping and lacquering machine.

Probably no other company has affected the growth of the U.S. collapsible squeeze tube industry as has White Metal. Kleinbeck, Rentschler and William Erhard, the latter joining the Hoboken firm in 1915 with no previous tube manufacturing experience, were instrumental in setting up rival firms. Kleinbeck and Rentschler, with Henry Braun, Ceasar Muzzi and the late Julius Lichtenstein, formed the Atlantic Manufacturing Co. in 1920 in

Newark with which Braun, now president, Kleinbeck as vice president and general manager, and Muzzi as treasurer still are identified. Rentschler later sold his

holdings and set up the Art Tube Co. in Irvington, N.J. Erhard joined the newly-formed Globe Collapsible Tube Co. in Hoboken.

The five-year period after World War I saw the industry's greatest growth. Ten companies sprang up, of which seven remain. The first postwar plant was Bond Manufacturing Co. in Wilmington, Del., which started fabricating tubes in 1919. Bond had been producing bottle crowns and composition cork and during the war turned out copper tips for artillery shells. The Heromade presses that were used to shape shell tips were adapted for tube manufacture, but they left much to be desired.

In a sense Bond was an offshoot of Wirz. Samuel Bond and Harry Scott, with Charles Tome, organized the company in 1918. Tome had been sales manager of Wirz, and to obtain the production knowledge that was needed for tubes, he induced George Temple, Wirz's chief mechanic, to join the venture. It was with Bond that Frederic Remington, who went to Peerless in 1929 and a year later acquired a controlling interest, entered the industry. In the early twenties Bond bought the facilities of Western Cartridge Co. of East Alton, Ill., and in 1936 merged with the Pennsylvania Tube Co., which was organized in 1919 in Williamsport, Pa., to form the Bond-Penn Tube Co. Two years later, in 1938, Bond-Penn sold out to Wheeling.

MARK K. DRESDEN, former president of A. H. Wirz Inc., now retired, was first President of the Collapsible Tube Mfrs. Council

Globe's Early Trials .

The year 1918 also saw the formation of Globe, but it was some time before tubes came off its production lines. I. Lehman of Lehman Bros., metal brokers, set up the company in Hoboken and in 1920 hired the 26 year-old Erhard as manager. Globe had hard going. Its principal customer was E. R. Squibb & Sons-it got the business because it could satisfactorily re-produce the Squibb gold seal-but even with this substantial start, Globe was beset with financial troubles.

Squibb finally came to the rescue in 1925. For six months it poured money into Globe and supervised its operations. Finally, in order to maintain its source of tubes, Squibb bought Globe outright. It kept Erhard in charge of operations and in 1929 moved the plant to Squibb's operations in Brooklyn. It was during this period, and prior to a further move of operations to Long Island City in 1957 when Squibb established its Queens laboratories, that Ralph Westgate, an executive of the parent company, took an important interest in establishing Globe as a major

LOUIS H. C. HUNTOON, president of National Collapsible Tube Co. began by making captive cap tubes and later conventional type tubes

manufacturer of collapsible metal tubes. When Olin-Mathieson Chemical Corp. acquired Squibb, Globe became a subsidiary with Maxson Eddy as vice president and general manager and Erhard as director of operations. Eddy, who endeared himself to the industry in the brief time he was a part of it, died of a heart attack early in 1958, less than a year after Globe's operations were discontinued and the machinery and equipment sold. Most of its production facilities were bought by Victor Metal Products, Inc. for use in its domestic and foreign operations.

The late MAXSON B. EDDY, who died in 1958, served as Vice President and General Manager of the Globe Collapsible Tube Co.

Under Erhard, Globe made a number of technological contributions that further strengthened the industry's position in the packaging field. One was an improved version of the syrette, a self-contained single-dose hypodermic unit used in great numbers by the U.S. armed forces and its allies in both World War II and the Korean war.

The idea of a syrette was not new with Globe. Before World War I a man named Greeley patented a small collapsible metal tube having a solid neck except for a small hole, less than the diameter of a needle, through its center. The Mulford Co., a Baltimore pharmaceutical manufacturer, bought the Greeley patents, but efforts to produce the syrettes proved unprofitable because of a leakage problem. Early in World War I the Army asked Mulford if it could supply a "Hypo Unit" of the Greeley type in two forms-one to contain strychnine, the other morphine. Combat troops were to be supplied each type. The strychnine was to be used by a soldier if he felt faint, the morphine if in severe pain. The Army laid down one condition: the syrette was to be made so that it could be used by a wounded man with only one hand, and, in extreme cases only, with two fingers remaining.

WILLIAM SCHROEDER is co-owner of the Michigan Collapsible Tube Co. established in East Detroit, Mich in 1932

Mulford assigned Dr. Paul S. Pittenger to design a syrette to meet the Army's unusual specifications and he subsequently patented two units, one a collapsible rubber tube of two types, the other a metal tube that overcame the defects of the Greeley unit. Several hundreds of thousands of the metal type were supplied to the Army and for many years Mulford continued to market sterile solutions in these containers.

Late in 1938 the Army and Navy asked Squibb, which filled the syrettes with morphine, to see what it could do to improve on the Mulford unit. Erhard came up with what was wanted in a single day. Essentially, the syrette is a metal tube fitted with a hypodermic needle protected by a transparent hood. It proved its value by minimizing pain to battle casualties and danger of death from shock. Squibb made 100,000 syrettes for experimental purposes and

these proved so successful that the armed forces increased their orders. All told, Squibb and Globe turned out 75 million syrettes during World War II, including a shipment that arrived at Pearl Harbor on the day that strategic U.S. Naval base was sneak-attacked by the Japanese.

FREDERICK RENTSCHLER, who will be 84 years old in April, comes to work nearly every day to direct the affairs of the Art Tube Co.

The Mastitis Tube

Globe also was a supplier of mastitis tubes of which Peerless was the original developer. The idea for the mastitus tube, so named because of an elongated tip that enables dairy farmers to administer antibiotics to cattle afflicted with mastitis, a disease comparable to the common cold in humans and which affects the udders of milch cows, stemmed from Lederle Laboratories. Lederle saw in the metal tube a means of successfully combatting mastitis and presented the challenge to several industry manufacturers. Peerless was the first to solve the problem. Wirz developed a different type of mastitis tube, one with a friction fit cap and no thread, for another customer. Peerless and Wirz are the leading suppliers of mastitis tubes which have so simplified treatment that the incidence of the disease has been reduced substantially.

Three companies set up business in 1919. Victor Metal Products, one of the industry's larger producers, in Brooklyn; National Collapsible Tube Co. in Providence, R.I., and Pennsylvania Collapsible Tube Co. in Williamsport. Victor's forerunner was the American Metal Co. founded by Lazarus Muscat and now headed by his son Victor. American Metal made impact extrusions and dealt in metals, including blanks for tubes, and it was a natural step to turn to the manufacture of tubes. For many years, and particularly during World War II, Victor's Brooklyn plant was expertly managed by Joel Kronman, who died in 1955. Victor's plants are now located in Newport, Ark., and Chico, Calif. and are owned in part by The Colgate Palmolive Co.

JOSEPH D. MARTIN, president of Sun Tube Corp. a subsidiary of the American Can Co. continued effective production methods

National was an outgrowth of a small munitions plant established by William C. Huntoon. For years it manufactured tubes by a true extrusion process. By this

method a cup was formed from the blank, which in turn, was placed on a dial and forced through a die, the complete tube coming out through the die. This was an ideal method for captive-cap tubes (William's shaving cream tube), but not for other kinds. While the company continued to maintain interest in this type of closure, producing them on a volume basis for a time, it replaced

its original presses for the type used today and began manufacturing tubes by conventional means in 1933.

Atlantic and Aluminum Company of America joined the industry in 1920, the former in Newark and the later along the Hudson river in Edgewater, N.J. Kleinbeck and Rentschler, after helping to establish Atlantic, continued

KARL A. KLEINBECK, president of Victor Metal Products established in 1929 which now operates plan Is in Arkansas and California

their relationship until 1927 when Rentschler, who in 1957 marked his sixtieth year in the tube industry-first in Germany, then in France, and since 1914 in the United States founded Art Tube Co.

Enter Aluminum

Aluminum's possibilities as a tube metal brought Alcoa into the field. The first collapsible tubes of aluminum were produced experimentally by Neher Co. in 1914 in Switzerland. Shortages of tin and lead, born of World War I, turned attention to aluminum which a generation later was to command top priority in World War II. Commercial production was started in 1915. By the end of 1916 Neher Co. was producing aluminum tubes at the rate of 6,000 gross per month, climbing to a rate of 20,000 gross per month by the following year. The tubes were used mostly for toothpastes and toilet creams and manufacturing technique reached the point where it was believed the product offered an outlet for aluminum.

CHARLES KLEINBECK vice president of the Atlantic Manufacturing Co. was one of the founders of the company in 1920

With the end of the war, lead and tin, particularly tin, became more plentiful, and interest in aluminum as a tube metal took a sharp drop. One reason was that the metal, considerably harder than tin or lead, is more difficult to extrude. Then, too, larger and more powerful presses are required, an expenditure few companies were willing to make in so doubtful a market. Furthermore, it was apparent that extensive research and development would be necessary if aluminum was to gain a foothold. These were the facts that led J. S. Turner, when he went to Europe in 1920, to dismiss any thought of manufacturing aluminum tubes. But these problems did not deter Alcoa. It was convinced that once the extrusion difficulties were solved, aluminum eventually would win acceptance and ultimately capture a major portion of the market.

Alcoa purchased equipment in Switzerland and installed the machinery at its Edgewater, (N.J.) works. This unit started limited production in 1921.

Competition of tin and lead made the introduction of the aluminum collapsible tube extremely difficult. Moreover, much of the original foreign equipment had become inferior to American machinery. As a result, Alcoa purchased new equipment and developed improved methods to put the manufacture of aluminum collapsible tubes on a commercial basis. For a number of years the Alcoa operations, guided by Seth Malby and aided by R. V. (Reg) Elliot, who died only a few months away from retirement in 1958, pioneered the manufacture of aluminum tubes in this country. It was Malby's vision and persistence that prompted Alcoa to first enter and then persevere in tube production.

LESTER B. PLATT who served for 20 years as secretary-treasurer of the Collapsible Tube Mfrs. Assn. and also later, the Council

Statistics tell the story of aluminum's phenomenal rise in the post-world War II era. Consumption of aluminum tubes, as compared with those of other metals, skyrocketed from 5% in 1945 to 58.89% in 1957. Aluminum tube production advanced from 72,305 gross in 1944 to 1,850,988 gross in four years. In 1955, an industry total of 3,888,376 gross of aluminum tubes were manufactured, a figure exceeding the 1937 total production of tubes of all types.

After introducing the aluminum collapsible tubes in this country, Alcoa encouraged other manufacturers to enter the field and offered them the production knowhow and tooling techniques it had developed. Prospective tube fabricators also were given access to Alcoa's research and development facilities as well as the privilege of inspecting the company's tube-making equipment.

JOSEPH C. STEINER has guided the Atlas Collapsible Tube Co. through the stormy years in the early twenties to its present position

Co-operative efforts by Alcoa and a leading dentifrice manufacturer culminated in 1944-the year it set up straight line production, one of the earliest of such attempts-in the development of a satisfactory aluminum tube for dental cream. Alcoa later encouraged other tube manufacturers to use aluminum for dentifrice packaging, thus vastly expanding the market for aluminum tubes. An inhibitor was incorporated in some dentifrices to assure their compatibility with aluminum. Lather-type shaving creams, likewise, presented corrosion problems, which Alcoa solved by developing an inhibitor. Today, such creams are packaged satisfactorily in aluminum tubes. Alcoa also has worked extensively and successfully on interior tube coatings for products which could not be reformulated for packaging in plain aluminum.

Atlas' Early Troubles

Probably no company has survived more vicissitudes than

Atlas which started out in 1922 as the Horak Manufacturing Co. Jaroslav Horak, a self-styled inventor, claimed to have found a new way to manufacture tubes, but in three years the company lost approximately $200,000 and finally went into bankruptcy. One of the stockholders, Joseph C. Steiner, Sr., who had dropped $50,000 into the venture, acquired the company at the foreclosure sale and reincorporated it under the name Atlas. Horak again entered the picture, this time as co-owner and vice president, but the losses continued and Steiner pulled out in 1927 with a chattel mortgage against the property.

For the next three years new money and new life were pumped into Atlas without results. At the beginning of 1930, J. C. Steiner Jr. took over. He had been given the chattel mortgage as a Christmas present and told to see what he could do with the company. The younger Steiner turned to his father-in-law, Frank Simek, a retired manufacturer who had organized the Columbia Snap Fastner Co., for financial assistance and engineering know-how. One of the first things young Steiner did was to make a trip east where all of the tube plants were then located. He visited Peerless, where Remington had just assumed control, and was "shown everything except the books." With the knowledge gained at Peerless, and with a new extrusion press and decorating equipment bought during the trip, Steiner and his father-in-law set to work. They modernized the Atlas plant, setting up one of the first conveyor systems between the coating machines, the drying ovens and the printing equipment, but it was four or five years before either drew any salary above the $25-a-week they had allotted themselves. Nevertheless, their business prospered, red ink gave way to black, and with the business that accrued during World War II, the headaches came to an end. So, too, did the corporation. It was dissolved in 1945 in favor of a six-way family partnership.

Great Growth Ends

Establishment of Sun Tube Corp. in 1924 climaxed a rapid period of growth for the industry. Beginning in 1919, six companies came into being in as many years and only three others were to come along to give the industry its present form. There were others but these either would be absorbed or would pass out of the picture altogether. Some had been set up to package the products they manufactured and did not attempt to sell tubes to others. Wheeling bought out Larkin Co. of Buffalo; Peerless acquired the tube manufacturing units of Lehn & Fink and Devoe & Raynolds; Wheeling and Sheffield split the

facilities of Mechanical & Chemical Engineering Co. of Leominster, Mass., and Bond-Penn's units were sold to Wheeling, Victor, Wirz and others. Three already abandoned or would give up the manufacture of tubes: Bay State Collapsible Tube Co., Universal Collapsible Tube Co., and Consolidated Fruit Jar Co.

Sun's organizing corps were former Peerless men Frank J. Lynch, Donald M. Smith and others and they had the backing of Henry, Lee and William Bristol of Bristol-Myers Co. Lynch, an automobile race driver and aviator who was killed in an airplane accident in 1931, evolved straight-line production techniques. This made necessary the development of new types of equipment and the adaptation of conventional machinery to automatize insofar as possible the continuous movement of tubes from operation to operation. The engineering work was carried out by Vice President John H. Friden. Lynch, Friden, and former presidents William M. Rose and Rudolph S. Schenk, built Sun into one of the industry's larger companies, located at Hillside, N.J.

Eventually Sun became a subsidiary of Bristol-Myers. In 1950, it moved its aluminum tube and condenser can facilities to a modern plant at Washington, N.J. and later was joined in the condenser can business by Peerless, Wirz and White. Kenneth M. Leghorn, who joined Sun in 1947, was appointed president in 1953. In December, 1956, Sun was sold to American Can Co., which previously had bought the plastic tube manufacturing facilities of Bradley Container Corp. in Maynard, Mass., from Olin-Mathieson, and retained Leghorn as president. For Sun and another firm, Kienle & Co., a manufacturer of lithographing inks and enamels, Canco paid the equivalent of 73/4 million in stock. In July, 1958, Leghorn took over as head of Bradley and Joseph V. Martin, Sun executive vice president, stepped up to the Sun presidency.

Sun's 'Single-Shot' Tube

Sun has a number of tube "firsts" to its credit. One of note is the break-off tip tube for which, due to patent rights, it was the sole manufacturer for many years. The "single-shot" tube, with a finger-nail indentation so that the flat end of the container can be torn off easily, was first used to package individual servings of G. Washington instant coffee and later Bromo-Seltzer. The latter, for single doses, still is packaged in this manner, and represents one of the most spectacular applications of tube packaging. Another important use for "single-shot" tubes came later, in large extent after 1950, when paint manufacturers, in order to provide a wide range of colors

without factory pre-mixing and to reduce storage space at the factory, wholesale and retail levels, adapted them for colorants. By simply adding a coded tube of colorant to a base paint, usually white, the range of available colors was extended into the hundreds. Every major paint manufacturer now has a paint-tube colorant system.

Sun also was the first company to make an aluminum tube having a break-off tip. It was the first in the industry to produce an aluminum aerosol container and it is one of two tube manufacturers to make its own aluminum slugs.

The two companies that have come into being in the last quarter of a century are the Michigan Collapsible Tube Co. and Metal Container Corp. Michigan was organized in 1932 in Detroit. Its co-owners, who gained full control in 1953, are two brothers, Walter and William Schroeder. Walter became associated with the company shortly after it was established and William joined the firm in 1935. In 1953, operations were moved to East Detroit. Metal Container was set up in Hoboken by separate but related interests of White Metal in 1947 at a time when aluminum was becoming a major tube metal. As other Eastern tube manufacturers turned to aluminum, Metal Container's operations were moved to Indianapolis to cover midwest markets. A producer of aluminum tubes only, it is headed by Stanley Rumbough, Jr., as president. In 1955 White Metal formed a wholly-owned subsidiary called Extrusion Development Corporation in Hawthorne, N.J. This company, in addition to capacitor can manufacture, has developed automatic tube lines. Its president is ex-Sun president Schenk.

Perhaps the roughest period the industry has had to face was that during World War II when the government clamped top priorities on tin and aluminum. Tin at that time accounted for about 70 per cent of all tube manufacturing and lead most of the remainder. Aluminum had not yet come to the forefront, but its use for tubes was forbidden entirely. This left tube makers with lead as the only primary metal and a raw material unsuited for the packaging of many products. Tin was allowed only in amounts necessary for alloying and a few critical items. The War Production Board order banning or drastically restricting the use of strategic metals except for military use threatened to deal the tube industry a blow from which it might have taken years to recover. At this point industry members banded together and submitted to Washington a plan that won ready acceptance and saved tube manufacturers from a crippling blow.

In essence the proposal was this: the tube industry would set up a salvage depot to reclaim the metals from used tubes which consumers would be required to turn in at

retail stores in order to purchase a new tubed product. The tube industry's customers, under the leadership of Bristol-Myers, already had taken steps along this line by enlisting the aid of manufacturers of tubed articles and by initiating an extensive advertising and publicity program. The Toilet Goods Association, for example, urged in a bulletin to members that allout support be given to the collection of used tubes.

TSI to the Rescue

As a result, the Tin Salvage Institute was incorporated under New Jersey statute on February 2, 1942 less than two months after the Japanese attack on Pearl Harbor-and a contract negotiated May 28 with the Metals Reserve Co., which had been set up by the War Production Board's Metals Division. The contract designated the TSI as agent for the Metals Reserve Company under Conservation Order #M-115, which also stated that no retailer could sell a tube of toothpaste or shaving cream without getting a used tube in return. The TSI's purpose was to acquire and reclaim scrap metals or combinations of metals contained in collapsible tubes and dispose of the reclaimed metals in accordance with government wartime directives. The tin that was reclaimed went to the WPB, the lead to type foundries and paint manufacturers designated by the government. For every pound of tin that was reclaimed the tube industry received three pounds of lead. Each tube company was allotted metal base on end-use and in the amount used during a designated base period.

The TSI operated under an 11-member board of trustees and membership was open to both manufacturers and users of tubes. On the original board of trustees were Lee H. Bristol, Darlington (Wirz), Remington (Peerless), Rumbough (White Metal), Rose (Sun), Ralph S. Westgate (Globe), H. A. Larson (Sheffield), Joel Y. Lund of Lambert Pharmacal Co. of St. Louis, Roy W. Peet of Colgate-Palmolive-Peet Co. (now Colgate-Palmolive), Howard A. Sumner of Norwich Pharmacal Co. of Norwich, N.Y., and Henry F. Woulfe of Pepsodent, Chicago.

Rose, president of Sun Tube, was named president, and Remington was made vice president of TSI. Lester B. Platt, secretary-treasurer of the Collapsible Tube Manufacturers Association, was appointed secretary-treasurer, and Edward L. French of Sun as assistanttreasurer. Through the generosity of Bristol-Myers, the Tin Salvage Institute's operations were set up in the Newark meadows in an old World War I building owned by Bristol-Myers' Rubberset Division. Rose and Remington laid the groundwork, but day-to-day operations

were in charge of Schenk, later to become Sun president, and Friden.

To get started, $25,000 was raised in voluntary contributions from industry members. Sun also aided financially until the first appropriation of $50,000 was received from the government. When the contract was entered into with Metals Reserve it was expected that, by April 1943, TSI's operations would cease. Instead, TSI operated formally until April 7, 1945 when the Metals Reserve Contract was terminated officially.

TSI was one of the few, if not the only, war-born agency to end up with a profit. In the three years of its existence it turned over to the government $625,000 in profits. It was out of the red and in the black before the end of 1942. By December 30th of that year it had collected 1,987,941 tubes (of which 750,000 had not yet been processed), received aproximately $113,000 in advances, and made sales of $105,000, and had a $93,000 inventory. The conduct of the salvage depot elicited from the Metals Reserve vice president an official commendation on "an important wartime job well done."

Peerless' Waxing Machine

While the TSI kept the industry's head above water it was another wartime development that enabled it to package more products than otherwise would have been possible without tin, a metal unique for its nontoxic properties. This was a vastly efficient machine developed by Peerless for internal waxing of lead tubes. Waxing machines then in use were not entirely satisfactory, failing in many instances to provide a complete and reliable coating. Nor were there sufficient waxing machines available to the industry. Peerless' waxer was a vast improvement and Remington made available the machine design to the industry without royalty during the war. Peerless since has redesigned and improved the machines, obtaining a patent in 1947. About 50 of these waxers, requiring only one operator, are in use in this and other countries.

In spite of the difficulties under which the industry labored from 1942 through 1945 it nevertheless was essential to the war effort and it was so proclaimed. And the tube itself proved its versatility. Because of the ease with which this container can be handled, shipped and used under wartime conditions, and the protection afforded products over long periods of time, the armed forces specified its use for many items. Among the more unusual of these were camouflage paste for hands and face; chemical

substances that quickly detect, by changing color, the presence of poison gas; pyrotechnic pastes that, when ignited, were used as directional signals by airborne and other troops; ointments for the treatment of flash burns, and dental impression materials.

The tubes containing the chemicals for the detection of poison gases in small concentration were unusual. After other types of packages failed, the Chemical Warfare Service turned to the collapsible squeeze tube industry, taking the problem to Wirz. The Chester firm devised a lead tube with an elongated neck and sealed by low temperature solder. At one time, Wirz produced 1,400 gross of these tubes per day and more than 100 million tubes during the war. Sun was a second supplier and also produced the tube in quantity. For several years Peerless devoted more than half of its capacity to the production of ointment tubes for the prevention of poison gas burns.

With war out of the way the collapsible squeeze tube industry began to make up for lost time. Once its sources of metal became stabilized its annual volume continued to rise. By 1953 it had grown to 6,682,405 gross (962,262,320 units) and in 1955 to 7,264,947 gross (1,046,152,368 units), the first billion-unit year in the industry's history. In 1957, an all-time record of 7,568,324 gross (1,089,838,656 units) was produced. This was the end-use breakdown:

Aluminum continued its spectacular domination of metal use, accounting in 1957 for 58.83 per cent of metal content. Lead was next with 28.58 per cent followed by tin 9.62 per cent, tin-coated lead 1.86 per cent, and tinlead alloy 1.11 per cent.

The last decade has witnessed some significant shifts in tube consumption. The phenomenal growth of the pharmaceutical industry with the development of the so-called "wonder drugs" the sulfas, the antibiotics, the antihistamines and more recently the hormones has had a parallel growth in packaging and particularly with respect to the metal tube. Almost one-fifth of all tubes produced are now used for packaging medicinal and pharmaceutical items, a rate double that of 1947 and second only to the number of tubes produced for toothpastes. Peerless has specialized in tubes for pharmaceuticals for the last 25 years. Primarily responsible for a maximum effort in this direction was Theodore W. Schmitt, now executive vice president. He and President Remington were particularly aware of the advantages of diversification and a broader spread of tube production was deliberately sought. Wirz and Sheffield also have made major moves in the pharmaceutical field.

The parade of "wonder drugs" began in 1936 with development of the sulfas, the most spectacular drug discovery up to that time. By 1942, sulfathiozole ointment made its appearance in a tube and the following year a sulfadiazine ointment was marketed. These drugs later were overshadowed by penicillin and other antibiotics and by 1947 a penicillin ointment was made available for ophthalmic and dermatologic treatment. Both terramycin and aureomycin ointments in 1952, and hydrocortisone acetate and cortisone acetate in 1954 were, packaged in metal tubes. One of the principal reasons for the metal tube's preferred place in pharmaceutical packaging is the protection this type of container affords both the product and the consumer. Light and air cannot penetrate the tube, thus preserving antibiotics from loss of potency or contamination.

The packaging of medicinal and pharmaceutical preparation in tubes has not been without its problems. One came during World War II when tin and aluminum were cut off, shifting the burden to pure lead tubes and those having a slight mixture of tin. If wax linings had not been developed prior to the war many of the vital medications used by the armed forces could not have been packaged. The improvement in waxing machines for applying these coatings was the solution-one that brought approval from the Pure Food & Drug Administration-but soon another obstacle arose. This was the development of aqueous-base ointments in preference to those with a petrolatum base. Although more effective medically, the aqueous-base ointments even penetrated wax-lined chemically inert tin tubes. Vinylite and phenolic-base lacquer linings overcame this deficiency. In recent years great strides have been made in internal coatings of which there are three main types: waxes of various sorts, unconverted interior lacquers, and thermo-setting linings of a wide variety. These latter are converted resins, the toughest, hardest and most impervious of the linings in use. They are characterized by cohesiveness, continuity and flexibility of film.

Another development having wide use in the packaging of ethical medicinal and pharmaceutical preparations is that of strippable lithography or removable coatings. Strippable coatings were introduced by Wirz in 1953 and patented under the trade name of "ReadyPeel." Estimates of its use as a labeling medium range as high as fifty per cent and some companies, like Ciba Pharmaceutical Products, E. R. Squibb & Sons division of Olin-Mathieson, Chas. Pfizer & Co. and Lederle Laboratories of American Cyanamid Corp. have applied it to all tube packaging of ethical products. Strippable lithography's appeal is both economic and esthetic. In virtually all instances, packaging costs have been reduced where this type of decoration has

replaced gummed paper labels. But it is the improved appearance of the tube that has won the approval of doctors who prescribe and druggists who dispense ethical drugs. Druggists have termed it "the greatest advance in pharmaceutical packaging since invention of the collapsible tube." Once applied, the strippable coating is firmly affixed, and once removed, it cannot be replaced. It thus can serve as a permanent label or be quickly removed for prescription sale. For antibiotics packaged in such tubes, batch control numbers are die-stamped into the crimp at the time of filling.

Another shift in tube packaging has been in shaving creams. First packaged in a metal tube around 1915, shaving creams were once an important segment of the tube market. But with the introduction in 1951 of aerosol packaging shaving creams the demand for this end-use of tubes began to fall off. In fact, even before 1951, the use of tubes for shaving creams had lost some ground to the electric shaver. By the beginning of 1957, total production of shaving cream tubes had declined by nearly 50 per cent to less than five per cent of overall tube volume. The shift of consumer taste, influenced by the expenditure of millions of dollars for advertising and public relations activities, is a dramatic illustration of packaging's power in this era of mass merchandising.

The accelerated growth of the industry in the early part of the century led to the establishment of the Collapsible Tube Manufacturers Association in 1914 with R. L. Kenah of Standard as president and Herman Wirz of Wirz as secretary. Probably the most important action to result from this association was the general acceptance of a uniform code of trade practices. But the association functioned only irregularly, however, and for years after World War I it remained dormant. With the passage in 1933 of the National Industrial Recovery Act it was necessary to revive the association in order to establish an industry code. Stanley Rumbough Sr. of White Metal was elected president and Remington vice president. In 1935, the association was disbanded again when the NRA was declared unconstitutional, but two years later it was once more reorganized with Remington as president, J. Everton Turner of the then J. S. Turner White Metal Co. as vice president and Lester B. Platt of the management firm of Stevenson, Jordan & Harrison as secretary-treasurer. Through the interchange of ideas, the assembly of statistical data, and joint promotion of research and other matters, the association functioned successfully until March 31, 1957, when, because of disagreements it was terminated and replaced by the Collapsible Tube Manufacturers Council.

The tremendous emphasis that began to be placed on packaging after World War II, and the arrival on the competitive scene of the plastic tube, prompted the industry in 1954 to embark on a public relations program. Malby and Remington spearheaded the campaign. The Collapsible Tube Manufacturers Council was set up as the public relations arm of the CTMA and Carl Byoir & Associates, Inc. was retained as counsel. All members of the industry became members of the Council, whose primary aim was "to unite the thinking and the energies of the industry in promoting the important packaging role played by collapsible metal tubes--at a time when scores of industries are coming to market with conveniently packaged products that contribute to the health, enjoyment and comfort of the American people."

Mark Dresden of Wirz was elected first president of the Council and named to serve on a committee with him were Remington, who had taken an active part in promoting the program; C. Christy Jones of Alcoa; Charles Stiassni of White Metal; Muscat of Victor; Joseph H. Heideger of Standard; Leghorn of Sun and A. W. Paull Jr. of Wheeling. Dresden later was followed by Theodore W. Schmitt of Peerless as chairman.

Although successful in focusing national attention on metal tubes as a packaging medium-the two years of the program coincided with successive annual increases in tube shipments for the first time since 1945 -the program was discontinued in December 1956. Some members felt that the goal had been achieved and the program was discontinued temporarily. But the hard-selling efforts of rival packaging interests, the introduction of Ipana Plus in a plastic squeeze container, and the test marketing by a large toothpaste manufacturer (Colgate-Palmolive) of dentifrices in aerosol containers gave impetus to conducting new promotional activities. The effect of this competition still is an unanswered question.

The collapsible squeeze tube industry's path has not been all sweetness and light. While it has had its ups and downs, it nevertheless continues to grow, slowly to be sure. Complete mechanization of the production line, which would aid materially in lowering manufacturing costs, is an objective of the industry's more progressive firms. An internal coating that is more or less universal is another aim and considerable research is being undertaken by individual companies along this line.

Yet the collapsible metal tube that John Goffe Rand envisioned more than a hundred years ago still is basically the same in structure as it was in 1841. The fold-and-crimp seal long since has disappeared and the metal tube has progressed from a crude container to a package of distinction. That it has survived the competition down through the years is a tribute to the preferred position it enjoys in packaging.