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THE MICHELIN STEEL DISC WHEEL, A BUSINESS OPPORTUNITY

The productive diversification undertaken by Michelin et Cie. and their Italian subsidiary to cover the needs of the French army and Allies during the Great War opened the doors to the development of new technologies. In January 1920 the Michelin Tire Company from Milltown started marketing a novel article for the tire manufacturing company and had demonstrated its virtues by equipping vehicles during the war: pressed steel disc wheels. The American subsidiary supervised the local implantation following the global strategy imposed by the parent company in Clermont-Ferrand and facilitated by an agreement with the American company Budd. The battle between the different types of wheels—artillery, wire and steel discs—was in full swing.

1. Spring wheels

The wheels that fitted the first motor vehicles were direct adaptations of the two types prevailing in vehicles for human and animal traction. On one hand, there were the successors of large cart wheels with their sturdy wooden spokes and their exterior protected by a metallic circular band. On the other hand, there were those having a simple metallic structure derived from the wheels of tensioned wire spokes, used on bicycles and in light horse-drawn carriages. Both wheel models adopted solid rubber tires as a shock absorbing cover—especially applied in the transport of heavy cargo—, and later evolved towards the use of pneumatic tires with inner tubes (figs. 52-53). But other alternative technological solutions, developed in the period between the turn of the century and before World War I, called into question the hegemony of the pneumatic tire: the spring wheel and the cushion tire.

Looking for a way to emulate the shock absorption provided by pneumatic tire inner tubes, wheels with iron rims were developed whose structure incorporated a series of springs and tensioning mechanisms and shock absorbers. These employed metal and in some cases rubber pieces and buffers that were intended to absorb vibrations caused by irregular road surfaces.

In fact, this same approach had a historical precedent which had been applied to bicycles during the last decade of the 1800s. The shock absorption provided by tire inner tubes constituted an essential mile-

stone for the first cyclists. However, simultaneously, the materials of these primitive tires and their incipient technological development as well as deplorable roads and highways led to a succession of punctures and flat tires during their use. By 1890, what was known as “suspension” bicycles and wheels appeared on the market. They were an attempt to cushion tires by means of mechanisms that were coupled to frames and wheels of bicycles which were equipped with solid rubber tires (figs. 1-2).

Thus, the Parisian firm of Vincent Fils presented in their May 1892 catalog models of the *biciclette suspendue* Touriste 1 and Touriste 2, which were added to those already offered that same year by other industrialists such as Félix Clément. These, in part, were based on the model implanted by robust and comfortable American road bikes from brands such as Gormully & Jeffery.¹ In 1893 the company Delizy et Poirer obtained the confirmation of the patent they had solicited a year earlier and applied different springs and shock absorbers to their models of bicycles and tricycles which were advertised with the promise of “eliminating pneumatic tires” (fig. 1).² In August 1893 the magazine *Le Véloce-Sport* analyzed the new Persil suspension wheel, featuring a double ring equipped with numerous shock-absorbing springs (figs. 2).³

The first Salon du Cycle-Exposition Française Internationale de Vélocipédie, held between January 10-22, 1894 at the Salle Wagram facility in Paris, featured numerous bicycle spring wheels. The Lejeune, Lecourt, Devilliers-Cardon, Sénéchal and Sparre brands stood out in the event, although, as an article in the magazine *Touring Club de France* stated: “Unfortunately, the replacement of the pneumatic tire by another elastic intermediary is not an easy task to achieve and we may believe that, after a long period of trying to do so, the many failed tests begin to discourage inventors.”⁴

The increasing deployment of motor vehicles after the turn of the century caused the technological experience to be repeated. For human-powered vehicles, the steps taken to improve shock absorption led to the adaptation of *roues suspendues* (suspended wheels) principles to motor vehicles. This type of wheel developed for cars was generically called *roue élastique* in France and spring-wheel or resilient-wheel in the Anglo-Saxon market. This technology competed in the first decade of the twentieth century with that of the pneumatic tire, with the brands such as the French E. Dorival (1898);⁵ Roussel (1902),⁶ produced by the Société de Cadignan & Cie, who in 1905 changed the name of the article to Roue Cadignan (figs. 8-15);⁷ Cosset, patented by Marcel Cousset and produced in 1906 by the Société des Roues Élastiques a Jante Flexible of Paris (figs. 20-23);⁸ Coudert (1906), produced by Établissements Coudert (Peschadoires, Puy-de-Dôme); Guignard-Amelot; Lonet; Pradeau; Coymot, Cottineau, F. Lefebvre, Tardieu, Monnin-Damidot, Edmond-Lévi, Soleil and Garchey (figs. 3-7 and 9); British brands such as Empire—Robinson patent—and Halle;⁹ Italian brands such as Papone, conceived by Demetrio Papone; Feroci, invented by the engineer Cesare Feroci, and Leopoldo Gigli.

The prominence of this technology in France was driven by three automobile competitions. The first one, with a roundtrip route of 2,152 km—Paris-Dijon-Valence-Marseilles-Nice and returning to Paris—took place between April 17 and 26, 1906, was organized by *L'Auto* newspaper and supervised by the A.C.F. (Automobile Club de France). Of the thirteen registered vehicles equipped with spring wheels—brands such as Yberty-Merigoux, Monnin-Damidot, Halle Spring Wheel, Edmond Lévi, Garchey Wheel, Gobron-Brille and Soleil—, ten appeared at the starting line and only three finished the race in the conditions stipulated. These were, in order of arrival, EL-Edmond Lévi, Soleil and Garchey.¹⁰

The second competition was held a few months later, in August 1906, under the name Coupe du Matin as it was organized by the newspaper *Le Matin* (fig. 9). It was a test of resistance with a route of 6,000 km

whose finish line was located in the Parisian capital. Once again, and thus confirming their quality, the winners were the EL-Edmond Lévi wheels, manufactured in the town of Neuilly.¹¹

The third competition, held on April 7-17, 1908, was again sponsored by *L'Auto* and repeated the 1906 route. Of the twenty vehicles registered in the five established categories, only seven completed the test by adhering to the regulations, which stipulated an average daily speed of at least 30 km/h. The brands of spring wheel and cushion tire participants were: Automatique Ducasble (fitted on Motobloc, De Dion-Bouton, Mors, Vulpes and Delage automobiles); M.Y.G. (Peugeot, Darracq and Mors); Metallo-Elastic (Darracq, Womer and La Matais); Sider (Darracq, Alcyon and two Rebour cars); Gauthier (Renault); Ideale (Brasier); Linton (Gregoire); Delta (Lorraine-Dietrich); and Spiro-flexible (Renault). The winner was Dion-Bouton's 24 hp car fitted with Automatique Ducasble cushion tires, at an average speed of 60 km/h.¹²

The different types of spring wheels were made available through licenses or with new proposals in Great Britain with brands such as Airless Resilient Wheel and, in the United States, with the following brands: South Bend; Taylor Spring Wheel, Rutherford Pneumatic Wheel, Numode Endless Spring Tire, Crosson, Ideal Steel Wheel (fig. 28), Aerinax Elastic Wheel; Feroci—invented by the Italian engineer Cesare Feroci and licensed in the United States to the American Elastic Wheel Co.—, Standard Resilient Wheel, and Seaton (figs. 21-22), as well as dozens of patents (figs. 26-27).

2. Cushion tires

Not only the mechanics and structure of wheels were under the spotlight, alternatives to replace the tire were also sought out. The internal air cushion characteristic of pneumatic tires made it possible to travel in an automobile with greater comfort than solid rubber tires. But pneumatic tires depended on pressurized air, and punctures, a common and frequent occurrence, were a source of problems.

In France, the search for a solution different from pneumatic tires led to the development of the so-called *bandages élastiques* or *semi-pneumatiques*. In the Anglo-Saxon market, the term applied was cushion tires, although they were also known as airless tires, hybrid tires—as they were a mixture of solid and pneumatic tires—or cellular tires—as they relied on a solid tire with cavities or inner air cells that contained ordinary uncompressed air.

The following is the explanation provided by Pearson (1906): “In considering the tire industry, many people divide them into solids, pneumatics, and cushions. All agree that a pneumatic must be inflated (...) Tire development exhibits all gradations from the solid to the pneumatic types. [Speaking of the cushion tires] “some are like solids, with one or more small hollows or tunnels let into them length-wise. Some are much like pneumatics, in form and structure, relying upon their thick walls for support. Some are simply single tubes with resilient cores of varying design, which support the weight. Some are filled with spongy rubber or with inflated rubber balls, while others contain gelatinous or rubber-like fillers. Some are solid tires with cross perforations, giving the characteristic bridgework effect (...)”¹³ For these reasons, solid and cushion tires are puncture-proof whereas the pneumatic tire can go flat from a perforation, letting the air that sustains it escape.

A product that was fairly popular in France was made available by the Société de l'Automatique Ducasble (figs. 29-33). The Ducasble tire consisted of a solid rubber tire with no inner tube and did not employ metal parts or springs to obtain its shock-absorbing effect. This quality was achieved thanks to the

internal cavities and holes of its structure. The invention was based on Alfred Ducasble's patent, developed before the turn of the century for bicycle tires and exploited through the company Caoutchoucs Ducasble, founded in 1893. In February 1904 the Société l'Automatique Ducasble, Chambre à Air Libre was created, and the invention was gradually applied to all types of vehicles such as carts, wheelbarrows, baby carriages, wheelchairs, motorcycles, cars, vans and trucks.

The year 1907 marked the beginning of an incisive promotion strategy—intensified in 1908—based on the participation of Ducasble in various automobile races, such as the French competition of spring wheels, heavy truck contests or sponsorship of the Moto-Bloc car piloted by Charles Godard, registered in the New York-Paris international rally.¹⁴ The investment made in this item, disproportionate to the financial dimension of the company, was a major liability to the firm's viability: in 1907, racing events participation cost 59,666 French francs (FF) plus 22,964 FF for other advertising costs. In 1908 the expenses in competitions totaled 47,415 FF and 120,290 FF in advertising, with a turnover of 548,000 FF. The use of Ducasble tires, although constituting a minority market share and targeting the range of heavy vehicles, extended until the 1930s and was commercialized by the Compagnie Française du Caoutchouc.¹⁵

Another French company competing with Ducasble in the early 1900s was YMG, whose name was derived from the initials of business partners Jean-Louis Yberty, President of the Automobile Club d'Auvergne and Vice President of the Clermont-Ferrand Chambre de Commerce, Émile-Baptiste Méri-goux, Director of a thermal resort in Royat, and Louis Goussard. The cushion tire brand YMG was manufactured by the Société d'Études des Bandages Élastiques, based in Royat-les-Bains, Puy-de-Dôme (figs. 34-35).¹⁶

This type of cushion tire was known by other names in the American market. The brand names that were amongst the most outstanding included Lattina, Brooke, B-OK, Motz, Goshen, Fawkes, Dayton and Trublpruf. In mid-1899, The Rubber Tire Co. of Philadelphia introduced the Lattina Cellular Tire, a tire with small inner air chambers originally designed for bicycles and wagons—patented January 23, 1894—and also ready to equip motor vehicles (figs. 38-40). Manufacturing was commissioned to the International Automobile & Vehicle Tire Co. of New York, a company that would later be transferred to Milltown and would be acquired in 1907 by Michelin.¹⁷

The Brooke Airless Pneumatic Tire Company in Denver, Colorado was created in 1901 to exploit the patent of Mary Edith Brooke,¹⁸ who held the position of General Manager. The tire featured a casing containing a rubber interior with a series of regular subdivisions not sealed together. In principle it was designed for use in bicycles but subsequently its application was extended to carts and carriages and later to the motor vehicle sector.¹⁹

The B-OK Tire company from Chicago, Illinois, patented in 1902 and marketed a year later their B-OK tire model for wheels of cars, motorcycles and automobiles. It consisted of a cylindrical cover whose interior sheltered, protected by a layer of rubberized textiles, a core filled with spongy rubber that provided a certain level of shock absorption. In this way, as it was not filled with air, punctures were avoided. In 1904 its manufacture was licensed to the Western Rubber Company of Goshen, Indiana.²⁰

The Motz Trouble-Proof tire, designed for heavy electric vehicles, was developed and patented in 1909 by Charles A. Motz from Akron, Ohio.²¹ It had no perforations, but instead possessed a profile that deviated from the rounded regularity of the currently utilized solid rubber tires. This tire had spaces in

the sidewalls and indentations and reinforcements in a double tread, which allowed it to respond with some elasticity to roadway irregularities (figs. 41-43). The business was acquired in 1915 by Goodyear.

The Goshen Tire & Rubber Company from Goshen, Indiana, marketed in early 1909 their Goshen Airless model, in which the space occupied by the inner tube was replaced by a series of globular cavities separated by solid rubber walls (fig. 44 and 46).²² The company closed a few months later, but a similar technology was applied at the end of that year to the National Airless tire, manufactured by the Airless Tire Company from Indianapolis, Indiana (figs. 45)²³

Charles G. Fawkes, a mechanic, inventor and entrepreneur based in Denver, Colorado, patented a cushion tire for bicycles in 1900, whose interior was composed of a series of rubber discs alternating with air cells that contained ordinary uncompressed air.²⁴ The evolution of this constructive principle led him to develop the Fawkes Indestructible Airless Motor Tire in 1902 and put it to the test for about a year on different wagons in the city. The successful experience led to the creation on May 25, 1903 of The Fawkes Rubber Company, where he served as General Manager with John MacMillan as Vice President. The production of the versions for bicycles, wagons and motor vehicles was first commissioned to an Akron factory and subsequently, from 1904 until the end of 1906, to Milwaukee Rubber Works in Cudahy, Wisconsin (figs. 47).²⁵

In 1908 the Dayton Rubber Manufacturing Co. from Dayton, Ohio, took over the production of the Fawkes Indestructible Airless Motor Tire and finally acquired their patents as well as incorporating John MacMillan into the company with the position of General Manager.²⁶ The previous experience with manufacturing along with having control of an important package of patents related to that technology, led to the appearance of the company's own and improved proposal, the Dayton Airless Tire. It was well accepted and constituted a key contribution to the growth of the company. Dayton Airless tires were successfully commercialized until well into the 1920s (figs. 48-49).

The Lambert Trublpruf [contraction of trouble proof] tire was based on the principle of cellular chambers, although its rubber structure also incorporated intermediate tiers of layered textiles. Henry Miller Lambert (1858-1928) had been working on cushion tire technology since 1913 through the company Lambert Tire & Rubber founded that year in Portland, Oregon, and of which he was President.²⁷ A new factory was added in 1919 to the production center located in Barberton, Ohio, near Akron. The Trublpruf tire was manufactured until 1927—with presence in foreign markets, especially the Anglo-Saxon British, Australian and Canadian—, year in which the company transferred management to a new society that maintained the name but reoriented production to the pneumatic tire sector (figs. 50-51).²⁸

Finally, it is noteworthy to highlight the Triangle cushion tire among dozens of proposals launched at that time. It was made available in 1921 by the Triangle Tire Core Company from Des Moines, Iowa, and characterized by a series of triangular shock-absorbent gaps in the sidewalls that traversed the tire from one side to the other.²⁹

Despite efforts to standardize the new technology, which included aggressive advertising campaigns (figs. 10-12, 14-15, 20-23 and 48-49), the spring wheels and cushion tires lost the battle. Among the arguments in their favor—taking into account the absence of a pressurized inner tube—the impossibility of suffering a puncture was highlighted as well as the savings from having to load the vehicle with tools related to tire technology: tools for disassembling wheels and covers, repair kits with patches and glue, spare inner tubes, pressure control meters, tire jacks and compressed air bottles. But this list of advan-

tages was not enough. The final outcome was attributed to several factors: the mechanical complexity of spring wheel structure—an important handicap in case of breakdown or damage—the fact that each wheel contributed considerable weight to the vehicle, its high price and complex maintenance, as well as lower shock-absorbing and comfort performance than that offered by conventional pneumatic tires.³⁰ It was true that opting for pneumatic tire technology had a number of drawbacks, but no spring wheel or cushion tire could achieve the shock-absorbency that air provided. It was weightless and economical compared to the steel, rubber, springs and mechanical devices that tried to replace it.

3. W.W.W. (Wheels of Wire and Wood)

Wire-spoke wheels were the logical choice for the first automobiles, *voiturettes*, tricycles and motorcycles due to their lightness in weight. They were also commonly used in racing cars as the light weight and certain degree of shock-absorbency provided by their structure of numerous, fine tensioning spokes, were qualities valued for energetic driving maneuvers performed in motor racing. In any case, the difficulties in cleaning the dust and mud that constantly accumulated between the spokes—very few roads were paved—as well as the degradation caused by oxide and the replacement needed when damaged, required that they be continuously maintained.

Among the principal manufacturers of wire-spoke wheels were Britain's Dunlop, Humber, Riley and especially Rudge-Whitworth, which had produced these types of wheels since 1905 and which had a prominent presence in France and the United States. In the U.S., this was achieved through licensing with Marlin-Rockwell.

The American market was also nurtured by important local firms such as McCue Manufacturing Company in Buffalo, New York, active since 1912; Houk Manufacturing Company—which began their business in 1913 by acquiring the McCue factory and which in turn was absorbed in 1917 by the mighty Wire Wheel Corporation of America (figs. 54-55)—; Grant Wire Wheel Mfg. Company from Chicago, Illinois, since 1917 (figs. 59); Dayton Wire Wheel Co. from Dayton, Ohio (figs. 61-62); National Wire Wheel Works, Inc. from Geneva, New York and their Pasco Wire Wheel (figs. 56-58). Also in the state of Michigan was Simplex Wheel Co. from Grand Rapids (figs. 65-66)—successors of the Kol-Ben Wheel Co. (figs. 63-64)—, and the Castle & Kyte Co. with their Wheel Hayes Wire Wheel and Spranger Wire Wheel Co., both from Detroit.

The emergence of technologically more consistent vehicles with larger engines, which increased in size, capacity and weight, led to the gradual adoption of wooden spoke wheels, reinforced with metallic elements such as the rim and hub where the spokes were inserted (figs. 67-69). The wood employed for production had to be high quality, extracted from trees such as hickory and oak, which were used in Great Britain, or cypress which was utilized in France. This type of wheel was given the generic name of 'artillery wheel', because of their traditional use for the transport of heavy guns and military artillery elements (figs. 70-71). Artillery wheels provided great resistance, due to the rigidity of materials in their structure. They were also easier to maintain and care for, although their weight was almost twice that of a wire-spoke wheel. Their price was also a selling point, since they provided similar qualities but cost between one third to one half less than wheels with metallic spokes.³¹

In March 1918, the Philadelphia-based Automotive Wood Wheel Manufacturers Association was established to promote the interests of North American wooden wheel manufacturers on three fronts: to make themselves available to the Government and its contracts for equipping military vehicles; to initi-

ate a widespread publicity campaign to raise awareness among manufacturers, traders and customers (figs. 72-75); and to initiate actions to standardize measures employed, reducing the number of diameters and streamlining fittings on vehicle axles. One of the decisions agreed upon in 1921 was to establish an authorized official network of workshops for the sale and repair of artillery wheels, known as Official Wood Wheel Service Stations and identified with a corporate exterior sign (figs. 76-77).

The Automotive Metal Wheel Manufacturers Association was also created for the same reasons—to promote the emerging metal wheel sector. In August 1918, the Association of Automotive Wheel Manufacturers was established, founded by twelve companies that combined interests of the metal and wooden wheels industries, with special emphasis on standardization.³²

Employing wooden wheels that were adapted for use with cars lasted well into the twenties. They were gradually replaced by metallic ones, in the search for the ideal substitute that could provide the same or better performance, less weight and at a similar cost. The growing scarcity of noble wood reserves with adequate conditions, already a problem at the dawn of U.S. participation in World War I, precipitated the drive for technology based on other materials, benefiting the development of wire wheels and steel and aluminum disc wheels.³³

The trend is well reflected when comparing the number of cars exhibited and the types of wheels—artillery, wire and disc wheels—used to equip them in the different series of New York Automobile Shows celebrated between 1921 and 1926:

YEAR	ARTILLERY WHEELS	WIRE WHEELS	STEEL DISC WHEELS
1927	215	70	56
1928	229	67	37
1929	235	21	71
1930	128	24	145
1931	157	22	113
1932	169	8	52

Source: "Statistical picture of ten New York Shows," *Automotive Industries*, January 14, 1926, p. 53.

The entirely metallic wheels, with rims and thick spokes or made of a single piece of pressed steel and covered with a solid rubber strip, were patrimony of the heavy and primitive electric passenger and cargo vehicles that circulated at reduced speeds. In the United States about 80% of existing vehicles in 1899 were powered by electric or steam engines. But these wheels, besides being excessively heavy, were also very expensive. In addition, attempts to work with lighter metals, such as aluminum, were obstructed due to their high costs.

4. Repairs and spare tires

In the days of motor pioneers, during the last decades of the nineteenth century, there was a dearth of repair shop networks. Moreover, the precariousness of components for early automobiles and the inadequate road conditions always made it necessary to have tools and spare parts on hand—transported in the same vehicle—and that drivers and chauffeurs themselves be their own mechanic. It was therefore common to have two or three pneumatic spare tires attached to the sides of the automobile or stacked

in the back of the car and covered for protection. They were accompanied by various tools for disassembly and assembly that were also stored in the back—crowbar, wrenches and tire jacks, inflator pumps and compressed air bottles ...—plus a kit with spare inner tubes, patches and cement to repair flat tires in situ. Much of the technological effort was aimed at improving conditions for repairs, facilitating the dismantling of covers and allowing quick access to inner tubes for patching up or replacement. In this sense, innovations and improvements took place in the area of removable tires, such as the *jante amovible* [removable rim] developed by Michelin in 1906, which has evolved into similar and simpler mechanisms over time.

Roadside risks were mitigated by the appearance in Great Britain of the successful spare tire developed by partners and brothers Thomas and Walter Davies in their workshops at Davies Brothers Ironmongers & Cycle Engineers, active since 1895 on Stepney Street, in the town of Llanelli, South Wales. The idea of using an entire replacement wheel instead of loading several replacement covers and spare inner tubes, as well as saving on road repairs, was successfully presented at the 1905 Olympia Motor Show. Analogous to the sturdy bite of a bulldog—the company symbol—the Stepney tire, pre-inflated and ready to be used, fitted perfectly on the flat tire without dismantling it, functionally replacing it while on the way to the nearest workshop (figs. 78-80). The Stepney Spare Motor Wheel, Ltd. was established on November 23, 1906 to manufacture and commercialize the invention. Their production center was located in Llanelli and, by 1910, they had delegations in different European countries—France, Germany, Austria, Belgium and Italy (figs. 81-87)—as well as in North America—Canada and the United States. The U.S. division, The Spare Motor Wheel of America, was formed on October 14, 1907 and had their own factory in St. Anne, Illinois, south of Chicago (figs. 88-91).³⁴ During the first year of operation, with headquarters in New York and Chicago and distributors in 14 major cities, orders were received that exceeded 23,600 wheels. In certain countries under British influence, such as Malta or India, the word “stepney” has been perpetuated, becoming a generic name designating the spare tire of a vehicle.

Following the line marked by replacement wheels, British manufacturers’ aim was for spare tires to be exactly the same as the ones the car had originally been equipped with and, therefore, that the latter could be easily disassembled and assembled by the user himself. This involved loading the car with another wheel, which implied extra weight, and as such, the option of relatively light wire-spoke wheels was promoted. There were three firms that established the trend and popularized this product: Rudge-Whitworth, who launched their detachable wire wheel in 1906; Riley Engine Co., who did the same a year later; and Dunlop, who presented their proposal at the 1909 Olympia Motor Show (fig. 92),³⁵ all of them competing with other smaller manufacturers of detachable wheels such as Harper and Humber. The success of this new technology was reflected in the fact that several car companies in the country—such as Napier and Daimler—adopted the Rudge-Whitworth wheels as original equipment for all their models. The detachable Dunlop and Rudge-Whitworth wheels were also well received in France (figs. 98-100) and on the other side of the Atlantic.

In the United States, Rudge-Whitworth licensed their invention to the Marlin-Rockwell Corp., which produced the wire-spoke wheels in the Philadelphia-based Standard Roller Bearing Co. (figs. 95-97). Dunlop made and commercialized their wheels through the Dunlop Wire Wheel Corp. of America, with offices in Broadway and a factory in Long Island City, New York. They advertised wheels with the promise that “they could be disassembled and replaced in 30 seconds” (figs. 93-94).

Other local companies also offered their detachable wheels, but without limiting them to the technology of metallic tensioning spokes: by 1911 the proposals of the Swift Motor Co. adapted to an artillery

wheel appeared; those produced by the Goodyear Motor Wheel Co. for artillery wheels and metal spokes; or brands such as Jackson and Sankey, the latter having thick steel spokes. In 1917, firms such as the Kol-Ben Wheel Co. from Detroit—run by the Simplex Wheel Co. in Cadillac, Michigan—or the Great Western Mfg. Co. from Laporte, Indiana were added to the list.³⁶

5. Michelin's *roue amovible*

The concept of a “detachable wheel,” so fashionable in the years preceding World War I, became particularly important during the war, where the speed of changing a tire and simplicity of manipulation was not a matter of comfort but rather a vital issue. According to a 1918 article published in the American motor press:

“(…) The same applies in war. If a detachable wheel takes 2 min. to change and a demountable rim necessitates a stop of 10 min. in which to change and inflate the new tire every officer will plump for the detachable wheel.”³⁷

Although this problem was solved for automobiles due to lightweight tension wire wheels—easy to transport and replace (figs. 112-114)—, vans converted into ambulances and trucks transporting troops, ammunition, provisions and other cargo needed to have a specific solution. Heavy-duty vehicles routinely used sturdy artillery wheels with solid rubber tires to travel on often difficult terrain, which they did at low speed and with low shock-absorbency (figs. 115-116). The demands of a motorized military—and of the early tanks and armored vehicles, which were covered with metal plates and needed a similar solution to protect their vulnerable wheels—and of battlefields turned into severe testing grounds, fueled the full development and application of two pre-existing technologies: pneumatic truck tires and steel disc wheels.

Michelin found in both requirements a way to expand their limited—up to that time—radius of action and embrace new military contracts. To do this they decided to move forward and promote their own steel disc wheel, an idea already registered in the French patent office on December 8, 1913 with the signature of Jules André Michelin. The invention solved both the technology applied to individual wheels as well as to paired or twin wheels used in the rear of trucks and vans.³⁸ The experience gained in their military use could be capitalized on for the civil market.

In mid-1915 Michelin introduced the *roue amovible*, their detachable disc wheel model for passenger cars, buses and trucks, after several months of testing with a small production run on military vehicles, lightweight delivery trucks and the company's own commercial cars.³⁹ Simultaneously, Fiat automobiles and trucks, utilized by various armies of the Allied forces, were equipped with disc wheel rim technology for pneumatic tires developed by the firm's engineers and produced at the Turin factory.⁴⁰ The appearance was similar to Michelin's, but in construction they were considerably different as Fiat employed a disc reinforced by two smaller ones and usually fastened with five fixing nuts. The French firm opted for a single disc with six nuts (figs. 117-119). Between 1915-1916 all light trucks—1½ MT capacity—manufactured by Fiat for the Italian market were equipped with their disc wheels, as did 80 % of those exported to other countries.⁴¹

Detachables wheels with steel disc wheel rims became a novel and attractive product due to their strength, lightness and ease of maintenance and cleaning. They were the replacement for artillery wheels, which were more vulnerable to fire and missiles and less safe on the battlefield since wooden spokes could

break and damage the wheel, whereas disc wheels only became warped instead of breaking.⁴² Another quality cited in their favor derived from the properties of metal as a heat conductor, since the high temperatures of wheels during their functioning affected the life of the tire. According to a European study carried out in 1908 on racing car tires, at a speed of 135 km/h the temperature recorded in the inner tube was 96 °C and on the tire cover it reached 132 °C due to surface friction, internal frictions of the layers reinforcing the casing and the dilations and compressions of the rubber itself. The wide surface of the steel disc, which was in contact with air, helped to disperse heat.⁴³

The spokes utilized for other types of wheels were replaced by a circular sheet of pressed steel, slightly curved to give it a convex shape. In the center of the disc was the socket fit to the vehicle's axle, surrounded by six nuts to properly secure it. On the outer edge lay the rim whose function was to accommodate the pneumatic tire cover. The procedure for changing a flat tire was thus extremely simple and quick: after lifting the side of the car with a jack, the nuts that held the wheel to the axle were loosened and the wheel was disengaged with a lever. The entire wheel was removed and replaced by another following the reverse order of steps taken to disassemble it. The affected wheel was loaded into the automobile and later repaired at the mechanic's workshop.

Michelin's *roue amovible*, painted deep red, became the star product of the firm, especially after the end of the war and the resumption of conventional commercial activity. It was adopted by a large number of European manufacturers as an option for the original equipment of their vehicles. In 1920 it was estimated that at least 60 percent of French car production in that year were fitted with Michelin disc wheels.⁴⁴ A growing number of light and heavy trucks also used these wheels in their adapted version; disc wheels with double tires were fitted in the rear of the vehicle—coined by Michelin Jumelé in France and Dual or Michelin Twins in the Anglo-Saxon market—and individual tires in the front. Between 1919 and 1922 much of the publicity of the firm was dedicated to promoting the detachable disc wheels—usually associated with the also newly launched Cablé pneumatic tire—not only in the French national market (figs. 120-127) but also the entire European continent and in different international scenarios through respective agencies and subsidiaries (figs. 128-130, 133-134). The British market was the target of intense advertising activity carried out by the Michelin Tyre Co. Ltd. (figs. 135-139) and in the United States this was achieved by wide-ranging publicity conducted from the Michelin Tire Company in Milltown and their agreements with the Budd Wheel Co.

6. From wood to pressed steel

The manufacturer Edward Gowen Budd was one of the pioneers in addressing the technological transition from the typical wood frame chassis to the modern, all steel construction chassis through the Edward G. Budd Manufacturing Co. founded on July 22, 1912. In August 1916 they added the company's first wheels to their catalog, and in October of that year the creation of the Budd Wheel Corporation in Philadelphia, Pennsylvania was formalized so as to produce steel wheels and wire-spoke wheels.⁴⁵ The founding capital consisted of \$ 2,000,000, half of which was contributed by John North Willys—owner of Willys-Overland cars—, who made the first commissions to fit their vehicles with Budd wheels. This was followed by prominent companies such as Ford, Jordan, Dodge Brothers, Studebaker and Wills Ste. Claire.

The Edward G. Budd Mfg. Company actively participated in World War I, reorienting part of their productive capacity towards the manufacture of military equipment such as helmets for soldiers—about 20,000 units daily—, bombs and ammunition of various types and other articles of pressed

steel. It goes without saying that their war participation also included completing the commissions of car and truck manufacturers that were selected to supply the army.

In May 1917, the U.S. War Department established that 74,400 motor vehicles of all types were necessary for the war campaign, supplied by 59 different companies that—in the concrete case of automobiles—ranged from the simple and economical Saxon priced at \$420 to the powerful and well-equipped Locomobile at a cost of \$4,500 (and double the price for Locomobile limousines). A month later General Pershing arrived in France to command the newly formed American Expeditionary Force. According to post-war records, the A.E.F. had a fleet of about 9,500 passenger cars, of which 722 were limousines. General Pershing was always transported in one of several limousines acquired from the Locomobile firm, one of which was a custom model built especially for him.⁴⁶

Allied and American armies also used European and British cars and trucks, some of which—French manufacturers equipped by Michelin and Italian vehicles by Fiat—used the first steel disc wheels. Pershing “noticed the steel disc wheels used by French army trucks in 1917, and he realized their advantages,”⁴⁷ elaborating a directive that stipulated that limousines and cars of commanding officers were to have this new type of technology, rather than standardized artillery wheels. It is assumed that the Budd Wheel Corporation participated in those commissions; in 1918 the company completed a special order, a set of disc wheels to equip General Pershing’s private car (figs. 140-141).

Following the signing of the armistice, Edward G. Budd hastened to negotiate a contract to obtain the manufacturing license for the United States. Michelin, who had developed the technology and obtained the patent in France, had also inscribed the “Michelin Demountable Wheel” in the United States registry on May 21, 1919, and after an extension granted on June 3, 1920, legally obtained patent number 1,376,390 on April 26, 1921 (fig. 143).⁴⁸ To this patent were added others such as the Vehicle Wheel, inscribed on April 16, 1920 with reference number 374,505 and finally granted July 12, 1927, with reference number 1,635,894.⁴⁹

As explained in publicity texts used in advertisements for launching the product in the North American market, in January 1920:

“Michelin Steel Disc Wheels, famous for their heroic service throughout the Great War on thousands of staff cars, ambulances, trucks and other army vehicles, are now ready as factory equipment on American cars.” The Budd Wheel Corporation has been making Disc Wheels for the United States Government for several years (...) war-demands absorbed the entire production (...) it was only with the ending of hostilities that it became possible to offer Michelin Disc Wheels to the public.”⁵⁰

In successive campaigns, and as a sales pitch, the company also emphasized the effectiveness demonstrated by this type of wheel on the war front:

“Throughout the world war Michelin Disc Wheels did heroic work on thousands of cars, ambulances, trucks and other army vehicles. In the front of battle, over shell torn roads, on lines of communication—everywhere these sturdy wheels met the severest tests and proved themselves superior to all others in the essentials of safety, strength, simplicity and ease of operation” (fig. 147).

7. The Budd-Michelin disc wheel

Michelin ensured the presence of their invention in North America by means of the agreement reached with Budd. This was a different approach than what had been implanted in Europe, where the company itself produced the tire in their factories located in France and Italy, under direct supervision. The French firm appreciated and valued the knowledge and solvency of the local U.S. company, commissioning them with the production of steel disc wheels and granting exclusive rights of sale, but under the Michelin brand. The first American Michelin disc wheels were manufactured in late 1919 at the Budd Wheel Corp. plant, built at the crossing of Hunting Park Ave. and 25th Street in Philadelphia, as part of the industrial complex and headquarters of the parent company, the Edward G. Budd Mfg. Co.

It seems that in the first year, the distribution of wheels was realized taking advantage of Michelin's commercial network via different territorial dealerships. A news story published in April 1920 explains the planning of the new and spacious headquarters of the Michelin Tire Co. in San Francisco, California, an initiative provoked in part by the need for more storage space to house the new disc wheels.⁵¹

The appearance of the new product counted on an extensive publicity campaign, begun in January of 1920 and lasting until the end of the year. The Michelin Budd Wheel Corporation invested a considerable sum—estimated at least \$37,250 during 1920 and \$45,500 during 1922⁵²—to hire space for their advertisements in nationwide generalist magazines. The Michelin Disc Wheels were featured by advertisements in magazines such as *The Saturday Evening Post*, and by using color inserts and heavy weight paper in specialized publications of the automotive sector, such as *Automobile Trade Journal*, *Automotive Industries* and *Motor World*.

The tutelage of the American Michelin through the Wales Advertising Agency—which at that time handled their advertising account—and the work of art director Arthur Norman Edrop was evident in the graphic style used. It incorporated the potency of the two corporate colors blue and yellow, intensively applied in their tires' color advertisements, with the systematic use of lettering for mottos and with the recognizable Michelin logotype, realized by Edrop, heading the compositions.

In 1920 John N. Willys sold his share of the Budd Wheel Corp. to Edward G. Budd, who reestablished the firm a year later with the name of Budd Wheel Company. After a year without any advertising, the company resumed their commitment to Michelin in 1922, but redefined the strategy and role of each of the parties according to their own interests. Wheels, manufactured and distributed directly by Budd—through the company of the group called Budd-Michelin Wheel Co.—were renamed Budd-Michelin Steel Wheels and in their advertisements no graphic images were used that made reference to the corporate image employed by Michelin. As part of the agreement, Michelin Senior Manager Elmer E. Connolly served on the board of directors of the Budd-Michelin Wheel Company.⁵³

Jules Hauvette-Michelin was also a member of the company's board of directors in the last years of Michelin's presence in the United States. The tire manufacturer's former Vice President was negotiating with Budd about licenses and the implementation of their Michelines—lightweight motor-powered cars or trains equipped with pneumatic tires—during 1931 and 1932.⁵⁴

Although the promotion of disc wheels was headed by the Budd Wheel Co., in Michelin's advertising campaigns between 1920 and 1922, the new Universal Cord tires—called Cablé in France—were displayed in certain advertisements equipped with Budd disc wheels and accompanied by the motto "Michelin Cord Tire on Michelin Wheel." Contrary to what happened with the *roue amovible* in France,

Italy and Great Britain, in Michelin's American advertising, the mascot Bibendum only served as an advertisement for pneumatic tires, and never directly as a supporter of the disc wheels licensed to Budd (figs. 148 and 156).

As of 1921, Budd Wheel Co. engineers continued to work on the original design of the Michelin steel disc wheel, providing a number of technical improvements and fomenting its evolution. The many manufacturers who incorporated this technology as standard equipment or optional factory equipment for their vehicles during 1922—in automobiles this meant a set of five wheels, counting the spare tire—included Dodge Brothers, Studebaker, Willys-Knight, Jordan, Cleveland, Stearns, H.C.S., Yellow Cab, Chalmers, and Winton. The Ford Motor Company, also included in the list that year, became a major customer.

In 1922 Nash Motor Co. from Kenosha, Wisconsin, conducted a test to decide whether their cars should also be equipped with Budd-Michelin wheels. In May of that year they were offered as optional equipment, with a surcharge of \$25 in the vehicle's price for the complete set, at the expense of the usual wheels. Between the start of the offer and the end of the year, Nash buyers and customers acquired 27,505 disc wheels. During 1923 the figure amounted to 149,237. In July 1924, when taking stock of the proposal, the results showed that 75% of customers opted for the new equipment, despite the surcharge. Nash automobiles were equipped with Budd-Michelin wheels from that date onwards, a decision that proved to be a success: 508,404 wheels were sold in 1925 and 339,740 during the first five months of 1926,⁵⁵ the year in which the Packard Motor Car Company in Detroit also chose Budd-Michelin for original equipment of their models Six and Eight.⁵⁶

However, the gradual introduction of Budd-Michelin wheels did not directly affect pneumatic tire sales. During their appearance in 1920 under the name of Michelin Disc Wheel, disc wheels were announced in conjunction with Michelin tires, but their actual status as a standalone product allowed each automaker to fit them with a different brand with which it had established preferential treatment. Thus, for example, the 1925 press advertisements for the Six Sedan De Luxe model of the Overland Waterloo Company specified that it was delivered with Budd-Michelin disc wheels, as shown by the illustration of the vehicle ... which also portrayed the incorporation of Fisk's pneumatic tire model known as the Balloon.⁵⁶

In 1924 Budd's commercial and service network had two large warehouses and distribution centers in Chicago and San Francisco as well as territorial offices in those two cities and in New York and Detroit. They were also present in more than seventy cities in thirty-three states, as well as six key cities—Montreal, Toronto, Winnipeg, Calgary, Edmonton and Vancouver—in neighboring Canada. Budd service stations offered, in addition to sales, assistance in the placement of pneumatic tires and in the repair of wire-spoke wheels and steel disc wheels.⁵⁸ In 1925 production was moved to facilities located on Charlevoix Avenue in Detroit, taking advantage of being in proximity to factories of leaders in the automobile industry.

As of 1926, Budd's advertising campaigns were directed towards a prosperous and very competitive sector, that of freight and passenger transport vehicles. The long fleets of delivery trucks for different companies as well as bus lines offered enticing and highly contested accounts for industrialists from the motor sector, manufacturers of wheels and rims and for those commercializing pneumatic tires. Each vehicle was running on two directional front wheels and two pairs—also called twin or dual—in the rear, in addition to the spare wheels, attached to the sides or the rear of the vehicle. And each wheel had

a corresponding pneumatic tire. If we exclude the wheels manufactured by Budd, Michelin's share of this market segment was very limited, as compared to the strong presence of the leading tire companies Goodyear, Firestone U.S. Rubber and Goodrich, as well as other medium-sized competitors such as Fisk, General, Kelly, Mohawk, India or Miller.

Among the bus manufacturers fitted with Budd-Michelin wheels as original equipment was the Six Wheel Co. from Philadelphia, which was created in 1924 and launched the first vehicles produced by the company that same year. Among the trucks, for example, in 1926 the wheels were offered as an option for the factory equipped 2-Ton Truck model manufactured by Graham Brothers. Budd's advertisements for 1926 and 1927 proclaimed that a total of 100,000 heavy vehicles—the sum of 40,000 buses and 60,000 trucks—were circulating on their disc wheels in city streets, roads and highways throughout the country.

Towards the end of 1929 the productive link between the division of Budd and Michelin ended, and the name Budd-Michelin was no longer used in advertisements. At that time the tremendous growth of the automobile industry led the Budd company to embark on ambitious plans for growth, increasing the capacity of their facilities in Philadelphia, building a new factory in Detroit in 1926—where the Budd Wheel Co. relocated to—and boosting international expansion.⁵⁹ Despite the increase in new contracts with vehicle manufacturers, the heavy investment made and the economic downfall in 1930 affected the business. Finally, in 1946, the Budd Wheel Company ceased to exist and was incorporated into the Budd Manufacturing Company.

8. The competing firms

Michelin wheels not only had to compete against artillery wheels and wire-spoke wheels, several companies introduced other models into the market of pressed steel disc wheels based on the same technology. Among the first competitors was the Disteel wheel, manufactured by Detroit Pressed Steel Co. from Detroit, Michigan, and marketed by the subsidiary Disteel Corporation. It was based on the disc wheel designed in 1916 for the company by their engineer Alden. L. Putnam, who served in the U.S. Motor Transport division during the Great War. Perhaps that was where he had the opportunity to analyze the disc wheels used by European armies?⁶⁰

The patent of the invention—reference number 1,249,827—was granted on December 11, 1917 and, as early as 1918, it was commercialized. These two years held an advantage over Budd-Michelin which resulted in favorable market positioning (figs. 159-163). As of December 1917, the company was already in a position to produce wheels for the following automobile brands: Cadillac, Peerless, Packard, McFarlan, Murray, Fergus, Winton, Olds, Hale, Hupp and Dorris, at a competitive price similar to the cost of the usual wire-spoke wheels. During 1919 and 1920, the Disteel Wheel Company reached agreements to fit there disc wheels—as standard or factory equipment—on vehicles for up to 38 leading brands such as Apperson, Case, Elcar, National, King, Kissel, Lexington, McFarlan, Moon, Paige, Pierce Arrow, Premier, Velie, Wescott and Winton.⁶¹

The main rivals of the Budd-Michelin disc wheel, apart from Disteel, were the Gier-Tuarc and Buffalo Disc Wheel brands, manufactured by two other large companies in the sector. The Motor Wheel Corp. from Lansing, Michigan, was founded in January 1920 as a result of a merger between several wheel manufacturers from the Lansing area—Pruden Wheel Co., Auto Wheel Co. and Gier Pressed Steel Co.—and the wheel spoke manufacturer Weis & Lese Mfg. Co. with production centers in Jackson, also

in Michigan, as well as in Memphis, Tennessee. In 1921, the first Gier-Tuarc disc wheels were commercialized (figs. 164-170).⁶² By 1929, the Motor Wheel Corp. produced about 50 percent of the wheels required for the U.S. automobile industry.⁶³

The Wire Wheel Corporation from Buffalo, New York was constituted in March 1917 after bringing together the interests of several companies and gaining control of U.S. patents previously held by leading manufacturers of wire-spoke wheels: British Rudge-Whitworth Ltd., Dunlop Wire Wheel Corporation of America, Packard Motor Car Co., House Wire Wheel Corp and the companies controlled by George W. Houk (1866-October 1917)—Houk Wire Wheel and George W. Houk Co.—, the principal driving force behind the new corporation. The firm possessed the Hendee Mfg. Company factory in Springfield, Massachusetts, and the Houk Factory in Buffalo, New York. In addition to controlling much of the metal wheel market, by 1922 their catalog included disc wheels known as the Buffalo Disc Wheels brand (figs. 180-182).⁶⁴

Other competing brands were Schutte Disc Wheel, manufactured since 1918 by the Charles Schutte Body Co. from Lancaster, Pennsylvania (fig. 176); Globe Disc Wheel, manufactured since 1919 by The Globe Machine & Stamping Co. from Cleveland, Ohio (fig. 173); Perlees Wheel Disc, manufactured since 1920 by The Corcoran Mfg. Co. from Cincinnati, Ohio (fig. 174); Multidisc Wheel manufactured since 1920 by the Lack Mfg. Co. from Paducah, Kentucky (fig. 172); Hayes Disc Wheel, manufactured by the Hayes Wheel Company from Jackson, Michigan (figs. 183-184); Harvey Steel Wheel, manufactured by the Harvey Rim & Wheel Company from Buffalo, New York (figs. 171-172); Clark Disc Steel Wheel, manufactured by the Clark Equipment Co. from Buchanan, Michigan (figs. 177-178); and Walker Disc-Wheel Truck, manufactured by the Walker Vehicle Co. from Chicago (fig. 179).

One curious case was the Dayton Discwood Wheel, hybrid wheel produced in 1920 by the Dayton Automotive Wheel Co. from Dayton, Ohio. The outer appearance seemed to be similar to pressed steel disc wheels, but in this case the disc was composed of small, thin, rectangular pieces of wood glued together and firmly compressed, each placed in a direction different from the adjacent piece. This laminated surface, of great resistance and varnished to impart impermeability, had the advantage of being light weight, as compared to the wire-spoke wheel.⁶⁵ A year later Geo W. Smith & Co. from Philadelphia launched the Smith Woodisc Wheel on the market, which appeared similar to the Dayton wheel.

Notes

1. Vincent Fils's May catalog was included in the final pages of the magazine *Le Véloce-Sport*, June 16, 1892. Clément's model is mentioned in *Le Véloce-Sport*, March 17, 1892, p. 219, and the bicycles with Gormully & Jeffery's shock absorbers in the same number, p. 517.
2. Patent number 222407 for a new type of mechanical suspension Delizy et Poiret, represented by the company Louis Gudman et Cie. from Paris, was requested on June 17, 1892 and granted for fifteen years. "Brevets d'Invention," *Bulletin des Lois de la République Française number 1581*, 1893.
3. "Nouveautés et Inventions. Roues suspendues Persil," *Le Véloce-Sport*, August 17, 1893, p. 726.
4. "Les roues élastiques au Salon du Cycle," *Touring Club de France*, March 1894, p. 47-48.
5. "Bandage élastique système E. Dorival," *Le Chauffeur*, August 25, 1898, pp. 311-313.
6. "La roue Roussel," *Le Chauffeur*, June 25, 1902, pp. 236-237.
7. *Le Chauffeur*, December 20, 1905, pp. 236-237.

8. “Cosset’s elastic wheel,” *Motor*, July 1906. About patents granted to Marcel Cosset: French patent: *Roue élastique pour tous véhicules*, number 356.275, 1905. British patent: “Improvements in or relating to elastic wheels for vehicles and the like,” number 2582, 1906.
9. Léonce Ferrus conducted a specific analysis on the technology of spring wheels, destined to be presented at the III International Automobile Congress on May 24-29, 1906 in Milan. The text was serialized during 1906 in three issues of *The Horseless Age* magazine on September 19, pp. 351-353; October 3, pp. 403-406; and October 10, pp. 431-434. About the spring wheels presented at the Salon de l’Automobile in Paris, celebrated between December 8-25, 1905: “Le Salon de 1905,” *Revue Industrielle*, March 10, 1906, pp. 93-95.
10. “Le concours des roues élastiques,” *Le Chauffeur*, April 1, 1906, pp. 115-116; May 1, 1906, p. 141. “Spring wheel trials in Europe,” *The Horseless Age*, May 16, 1906, p. 703; “Resilient wheel competition,” *The Automobile*, May 10, 1906.
11. Souvestre, p. 752; and “La coupe du ‘Matin,’” *Le Chauffeur*, August 15, 1906, pp. 256-259 and September 1, 1906, pp. 281-283.
12. “The French spring wheel contest,” *The Horseless Age*, April 29 and May 6, 1908; “Elastic wheel and tire competition,” *Automobile Topics*, May 9, 1908.
13. Pearson (1906), pp. 153-159.
14. As a curiosity, the Ducasble tires are quoted in the adventure novel *Una Sfida al Polo* by Emilio Salgàri, published in 1909 and clearly inspired by the New York-Paris transoceanic rally (1908). Seeming like a modern product placement strategy, the text relates: “Here are our beds, our kitchen, our stove ... And these tires? Touch them! ... They are not just simple pneumatic tires, they are Ducasble, which cannot be damaged, and I have two others as spares. They could safely travel twenty-five thousand miles.” [*Ecco i nostri letti, ecco la nostra cucina, la nostra stufa, e queste ruote? Toccatele!... Non sono mica delle semplici pneumatiche, sono delle Ducasble che non si possono rompere e ne ho altre due di ricambio. Potrei percorrere, con tutta sicurezza, venticinquemila chilometri*]. SALGÀRI, Emilio. *Una Sfida al Polo*. Firenze: Roberto Bemporad & Figlio, 1909, p. 77.
15. For additional and detailed information on certain aspects of Ducasble’s history, see Dumond’s (1993) thesis, p. 569, 585 and 591 and especially the footnotes.
16. It seems that Jean Vincent François Amable Yberty, together with Émile Baptiste Méricoux, an engineer—both partners of the Établissement Thermal Royat-les-Bains—applied for the French patent for their “Système de bandages élastiques pour tous véhicules” in August 1905, which was granted in December of that same year. Towards 1910, a new initial was added to the initials of the two founders. The company was renamed YMG—or MYG as shown in some documents—when Louis Jean Baptiste Goussard was incorporated as partner. There are several references about them in technology patent documents: About Louis-Jean-Baptiste Goussard: “Perfectionnements aux jantes et aux bandages élastiques des roues de véhicules automobiles ou autres. Brevet d’invention number 437,572,” *Office National de la Propriété Industrielle, République Française*. About Yberty and Méricoux: “Système de bandage élastique pour tous véhicules. Brevet d’invention number 356,985,” *Office National de la Propriété Industrielle, République Française*.
17. “The Lattina cellular tire,” *The Horseless Age*, June 26, 1901; *The Horseless Age*, July 26, 1899, p. 13; “Rubber tires at carriage exhibition,” *The India Rubber World*, November 1, 1901, p. 43.
18. The patent was applied for on November 16, 1901 and granted with number 691,589 on January 21, 1902.
19. “Rubber tires at carriage exhibition,” *The India Rubber World*, November 1, 1901, p. 43; “The Brooke carriage tire,” *The India Rubber World*, March 1, 1902, p. 196.
20. “The ‘B-OK’ tire,” *The India Rubber World*, June 1, 1903, p. 306, and July 1, 1904, p. 359.
21. The patent was applied for on July 31, 1908 and granted with number 925,937 on June 22, 1909.

22. "The Goshen airless clincher tire," *The Horseless Age*, March 3, 1909.
23. "New 'National' airless tire," *Cycle and Automobile Trade Journal*, December 1909, p. 248; "Airless car tires," *Motor Age*, November 4, 1909.
24. The patent was applied for on September 19, 1903 and granted—number 776,656—on December 6, 1904.
25. "The other tires," *The India Rubber World*, February 1, 1904, p. 160.
26. "A new tire company in prospect," *The India Rubber World*, November 1, 1906, p. 64; "Dayton airless clincher tires," *Cycle and Automobile Trade Journal*, September 1908, p. 116.
27. "Inventor and manufacturer victim of heart attack," *The India Rubber World*, March 1, 1928.
28. In charge of this company were George Seiberling as General Manager, J. P. Seiberling, son of Frank A. Seiberling, and J. W. Coyote. "The Lambert Tire & Rubber Co.," *The India Rubber World*, June 1, 1927.
29. "Hollow brick principle applied to tires," *The India Rubber World*, March 1, 1921.
30. In the article reviewed in the bibliography, Mom (2003) points out a disadvantage: the spring wheels generated, at high speeds, small vibrations at a high frequency that were transmitted to the cockpit. For heavy transport trucks with speeds lower than 30 km/h, the spring wheels could be useful, but not for passenger cars.
31. "The development of the wire wheel," *The Automobile*, June 12, 1913.
32. "Wood Wheel Manufacturers meet," *Automobile Trade Journal*, March 1918, p. 130; *The Horseless Age*, March 1, 1918, p. 50; "Makers of wheels organize," *The Automobile & Automotive Industries*, August 29, 1918; "Hub standarization reduces hub sizes," *The Automobile & Automotive Industries*, December 23, 1920.
33. "Wheels will be metal," *Automotive Industries & The Automobile*, October 4, 1917.
34. According to the reviews "Stepney spare wheel," December 1, 1908, and "Stepney spare wheel in America," March 1, 1908 in *The India Rubber World*.
35. "The Olympia Motor Show," *The Times*, November 17, 1909.
36. "Demountable wheels, part II," *Motor Age*, October 12, 1911, pp. 32-35.
37. "European and U. S. A. tire practices," *Motor Age*, June 6, 1918, pp. 32-33.
38. As can be seen in the report of the United States Patent Office for Patent Number 1,635,894.
39. As also explained by the American press, which can be read in the news article "Detachable disc wheels" published in *The Automobile* magazine on July 8, 1915.
40. According to a letter from the Fiat Press Service in Paris, published in the article "All Fiats now have steel wheels," *The Automobile & Automotive Industries*, December 13, 1917, p. 1037.
41. "Italian truck makers flourishing," *The Automobile*, January 13, 1916, p. 60.; and "Disc wheels for passenger cars," *The Automobile & Automotive Industries*, May 1, 1919, p. 947.
42. "Design of European aviation truck," *Motor Age*, January 10, 1918, p. 22.
43. The study originally appeared published in the French magazine *Automobilia*, in August 1908, as quoted in "Wheels, ancient and modern, with some account of their origin and manufacture," *The Automobile*, May 4, 1911, p. 1041. Addressing the heat generated and its dispersion according to the type of wheel, the article "Wheels will be metal," published in *The Automobile & Automotive Industries*, October 4, 1917, p. 572, concludes: "Probably the lowest temperature in a wheel is recorded for the metal wheel with the largest surface area in contact with air."
44. "Michelin acts to safeguard patents," *The Automobile & Automotive Industries*, March 4, 1920.
45. "Budd Wheel incorporated," *Motor Age*, October 12, 1916; "Budd Wheel Co. to enlarge," *The Automobile*, October 12, 1916; and "Budd Wheel Corporation formed with \$ 2,000,000 capital stock," *Automobile Trade Journal*, November 1916, p. 125.
46. Mroz (2009), pp. 90 and 120-122

47. As Edward G. Budd Jr. explains in the text listed in the bibliography, p. 16.
48. "Michelin acts to safeguard patents," *The Automobile & Automotive Industries*, March 4, 1920.
49. As can be seen in the report of the United States Patent Office for Patent number 1,635,894.
50. Different fragments from 1920s publicity texts in press: in the advertisement published in *The Saturday Evening Post*, January 10, and inserts in the *Automobile Trade Journal* magazine in February, March, and May; and *Automotive Industries* in the month of August.
51. "San Francisco notes," *The India Rubber World*, April 1, 1920, p. 454.
52. As detailed in the section "Alphabetical List of Advertisers, 1913-1922," *National Markets and National Advertisers*. New York, The Crowell Publishing Company, 1923, p. 58. The information, developed by the Advertising Department of The Crowell Publishing Co., was based on the analysis of 34 generalist newspapers, leaders in the sector and distributed nationally.
53. "E. E. Connolly dies: tire manufacturer," *The New York Times*, July 26, 1926.
54. A 1932 news item reported that at the February 16 shareholders meeting for the Budd Wheel Co., the following had been reelected to the Board of Directors for the next three years: W. R. Basset, R. D. Campbell, William B. Read, Frank E. Smith and Jules Hauvette Michelin. In addition, they approved the management carried out during 1931. "Budd Wheel elect," *Automotive Industries*, February 20, 1932, p. 270.
55. According to the advertisement for the Budd Wheel Co. in *The Saturday Evening Post* on October 7, 1926.
56. According to the advertisement for the Budd Wheel Co. published in *The Saturday Evening Post* on March 13, 1927.
57. Advertisement for the Overland Waterloo Co. in the newspaper *Waterloo Evening Courier*, October 14, 1925.
58. Advertisement for the Budd Wheel Co. published in *Motor* magazine, November, 1924.
59. As early as 1919 the firm had initiated a series of contacts with French firms such as Citroën and Renault and British companies such as Austin, Morris or Crossley. André Citroën traveled to the United States in 1923 to visit Budd's factories, beginning an intense collaboration between both companies to develop the first French steel chassis. At the dawn of World War II, Budd had licensed their chassis and bodywork in countries such as France, Italy, Germany, Austria, Poland, Czechoslovakia, Russia and Sweden. According to the information in the article "The Budd story," which is included in the bibliography.
60. "Disc Wheel of great simplicity," *The Automobile*, October 12, 1916, p. 615.
61. As can be seen in the news item "Disteel Pressed Steel Disc Wheels Now Being Manufactured," *The Automobile & Automotive Industries*, December 13, 1917; and also in the advertisement published in magazine *Leslie's Weekly*, January 10, 1920 and in the series of color advertisements for the campaign with the motto "The wheels that complete the car" published during 1920.
62. "Wheel Cos. merge in \$10,000,000 corporation," *The Automobile & Automotive Industries*, January 29, 1920; and "Gier Tuarc Disc Wheel," *Motor Age*, June 23, 1921.
63. Dunn, p. 17. According to the author, Motor Wheel Corp. held half the market. At the same time, the rival firm The Wire Wheel Corp. of America claimed that in the specific segment of wire-spoke wheels their production covered 70 % of the needs for the entire industry—not including the Ford company.
64. "Houk interests merged," *Motor Age*, March 29, 1917; "Wire Wheel Corporation of America takes over Houk Holdings," *Automobile Trade Journal*, May 1917; "Wire Wheel Corp. buys Houk," *The Automobile*, March 29, 1917; "Houk, of Wire Wheel fame, dies," *Motor West*, October 15, 1917.
65. "Dayton Discwood," *Motor Age*, July 22, 1920; "The New Dayton Discwood Wheel," *Automobile Trade Journal*, August 1920, p.50.

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“Wire vs. wood wheels,” *Motor*, March 1912, pp. 17-18.

“European and U. S. A. tire practice,” *Motor Age*, June 6, 1918, pp. 32-33.

“Dual pneumatic equipment,” *The Automobile*, March 7, 1912.

“Pneumatic truck movement in France,” *Motor Age*, September 11, 1919, pp. 24-25.

“War makes tire works. Military trucks have trouble with solid tires,”
Motor Age, September 2, 1915, p. 24.

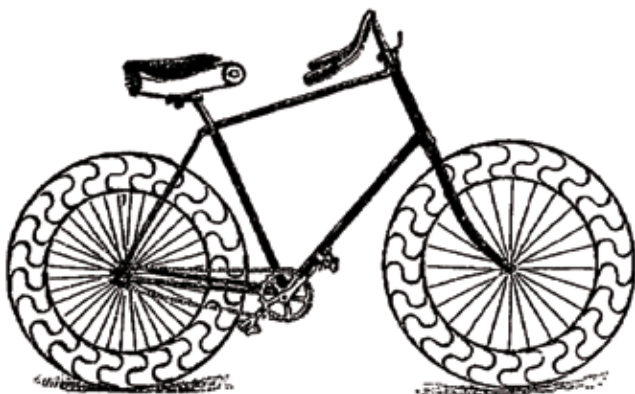
“Wheels will be metal,” *The Automobile and Automotive Industries*, October 4, 1917.

“New companies,” *The Automobile*, June 28, 1917.

“The Simplex Wire Wheel Co.,” *Automobile Trade Journal*, June 1920.

“National Wire Wheel Company buys manufacturing rights of the Zarth wheel,”
Automobile Trade Journal, December 1916;

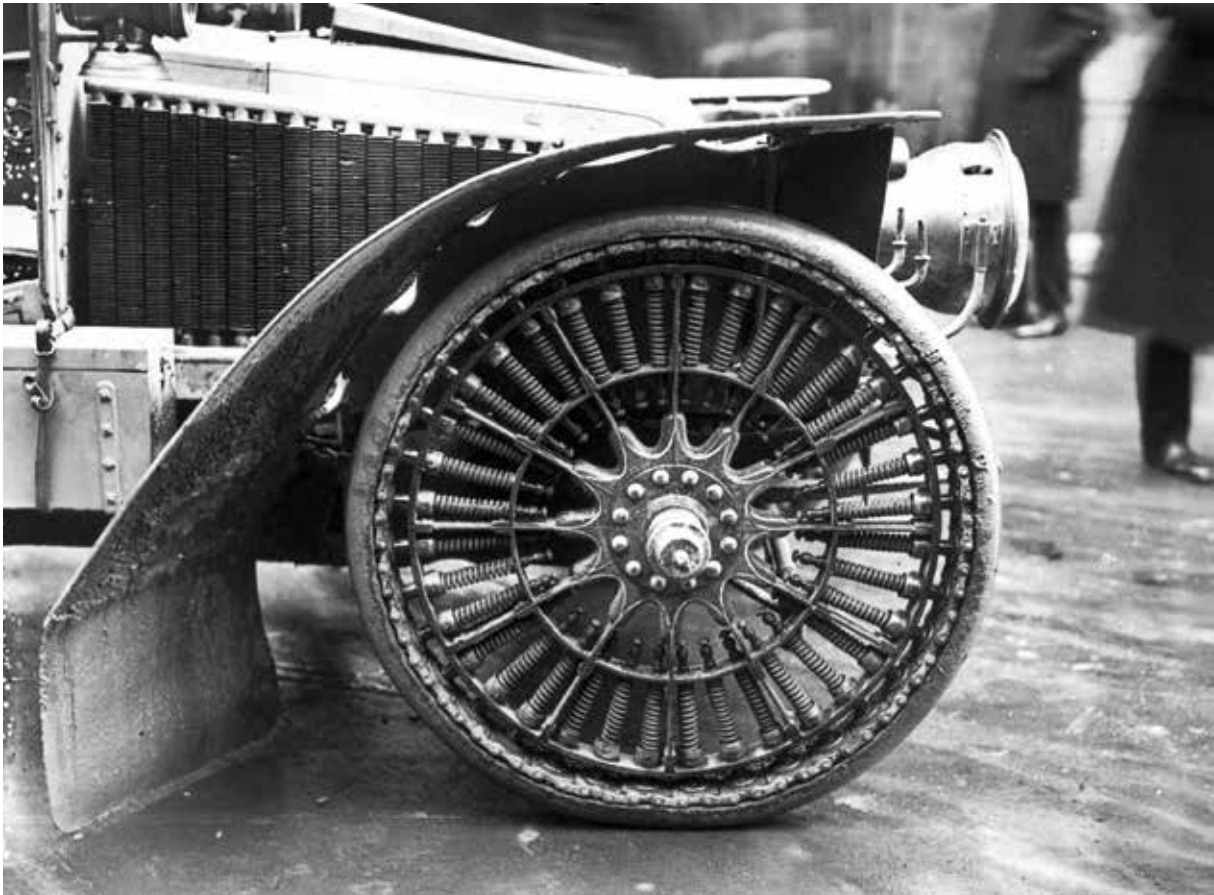
“The National Wire Wheel Works,” *Motor Record*, August 1919.



BICYCLES WITHOUT PNEUMATIC TIRES.

The image above portrays the suspension bicycle of the French brand Delizy et Poirret, with different shock-absorbing elements, such as the large vertical spring that was incorporated into the frame. The image on the left shows a diagram of the suspension wheels for the Persil brand from 1893. A series of wavy metal profiles placed between the two rings of each wheel act as springs and as such, in theory, replace the function of pneumatic tires and their inner tubes.

1. French lithograph poster, c. 1895. Printed by the workshop of Edward Ancourt et Cie, Paris.
2. Illustration of a bicycle equipped with the Persil wheel, published in *Le Vélocé-Sport*, August 17, 1893.



SPRING WHEELS.

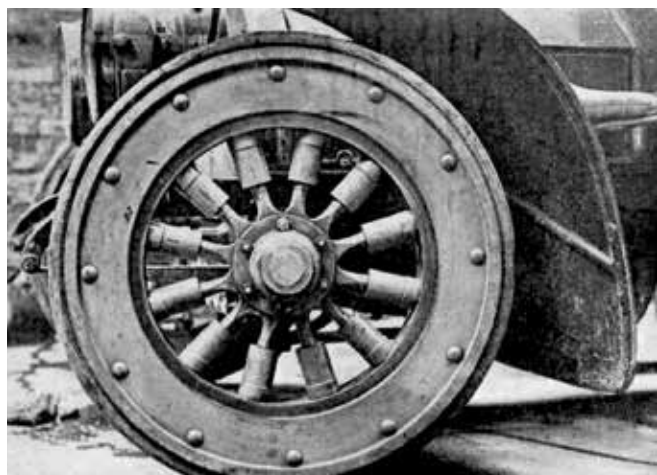
3. The image on the top of the page shows the French Gauthier spring wheels. Agency Rol, April 1908.

4. Top left, photographs of spring wheels used in German cars to alleviate the restrictions of pneumatic and solid rubber tires imposed by the lack of raw materials during World War I, in a news item published in *The India Rubber World*, March 1 1917.

5. In the center, the Seaton wheel, produced in the United States by The American Spring Wheel Co. from Cleveland, Ohio, according to a report published in *The India Rubber World*, July 1, 1909.

6. Top right, the spring wheel model published in *The India Rubber World*, May 1, 1907.

7. The image on the right depicts the French Pradeau spring wheel published in *The Horseless Age*, 1906.





SUPPRESSION DES PNEUS par
La Roue "EL"
 Système EDMOND LÉVI
 Breveté en France S. G. D. G. et à l'Étranger

La première et la seule de la catégorie des roues élastiques
 de la
COUPE du "MATIN"
 Médaille d'Or du Touring-Club de France

La Première du Concours de ROUES ÉLASTIQUES
 Gagnante du Challenge Chantemerle



La Coupe du Matin. — La Roue Élastique Edmond Lévi.

◆◆◆◆◆

USINES ET BUREAUX :
 26 et 28, rue de Sablonville - 9 et 11, rue d'Armenonville, Neuilly

Adresse Télégraphique NOUËL-NEUILLY — Téléphone 483

PROMOTIONAL SPRINGS.

Spring wheel technology had numerous support for its promotion such as spring wheels constituting a separate category in motor racing as well as being highlighted in specific testing involving different brands. Among the French manufacturing brands was the Roussel wheel, as shown in the above image, and the EL-system wheel produced by Édmond Lévi, winner of its category in the Coupe du Matin event sponsored by the Parisian newspaper *Le Matin*.

8. Portrait of the Count of Cadignan in his vehicle equipped with Roussel spring wheels, during the Paris-Nice parade in 1902.

9. Advertisement for the EL spring wheel (Édmond Lévi system), winner of the 1906 Coupe du Matin for its category. Advertisement published in the book *Histoire de l'Automobile*, 1907.

Chauffeurs,
Les Accidents d'Automobiles
 si fréquents
ET SOUVENT MORTELS
 sont causés par la crevaisson ou l'éclatement
 des **PNEUS**
Quoi qu'en disent les Fabricants et les
Intermédiaires intéressés,

Le Pneu... c'est la Mort!
LA ROUE ÉLASTIQUE
ROUSSEL

**C'EST
 LA
 VIE !**

Essais et Renseignements: Sté de CADIGNAN & Cie, 20, rue Brunel, PARIS
TÉLÉPHONE 533 12

WHEEL OF LIFE AND DEATH.

The pneumatic tire ... is death!
 Roussel's spring wheel is life! ...
 This is how the advertisement shown
 above portrays wheels as part of the
 aggressive advertising campaign against
 the pneumatic tire and in favor of the
 Roussel spring wheel, manufactured in
 France by the Société de Cadignan & Cie.

10. Advertisement published in
l'Auto magazine, July 10, 1904.

11. Advertisement published in the
 book *Histoire de l'Automobile*, 1907.

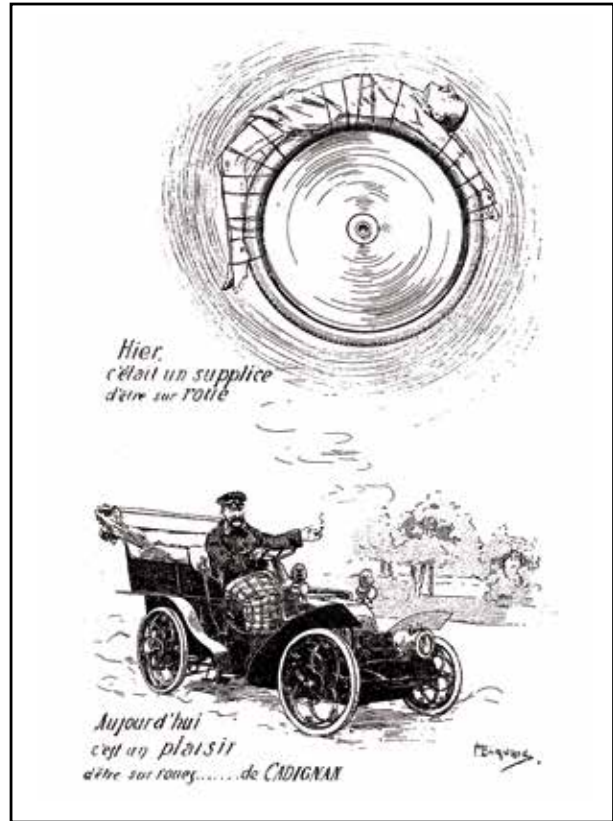
SUPPRESSION DU PNEU
 PAR LA
ROUE ÉLASTIQUE
de Cadignan

SYSTEME
 Louis MARCHAND
 Breveté en France
 et à l'Étranger

Essais et Références
SOCIÉTÉ DE CADIGNAN & C^e
 20, rue Brunel. — PARIS
TÉLÉPHONE 533-12



CADIGNAN (COMTE DE)



THE PROPHET OF THE WHEEL.

The two images shown here portray the Count of Cadignan as a defender of the spring wheel bearing his name. The above advertisement compares 'Yesterday'—depicting the driver enduring the rattling of conventional wheels as a victim of medieval torture known as "the breaking wheel" or "the Catherine wheel," in which the accused was executed by being tied to a carriage wheel—with 'Today', the driver enjoying a comfortable ride on Cadignan wheels.

On the left, the Count of Cadignan holds the spring wheel in a pose similar to the Judeo-Christian religious tradition's depiction of Moses with the Ten Commandments, addressing people from the top of Mount Sinai. The Count's prophetic vision is reinforced by the word "avenir" [the future] written on his bag.

Both illustrations are signed by Armand Biquard (1876-?), genre painter as well as advertising and press illustrator, collaborator with his caricatures in *Le Chauffeur*.

12-13. Advertisements published in the magazine *Le Chauffeur*, December 15, 1905. Illustrated by Armand Biquard.

LE PNEU... c'est L'ESCLAVAGE!

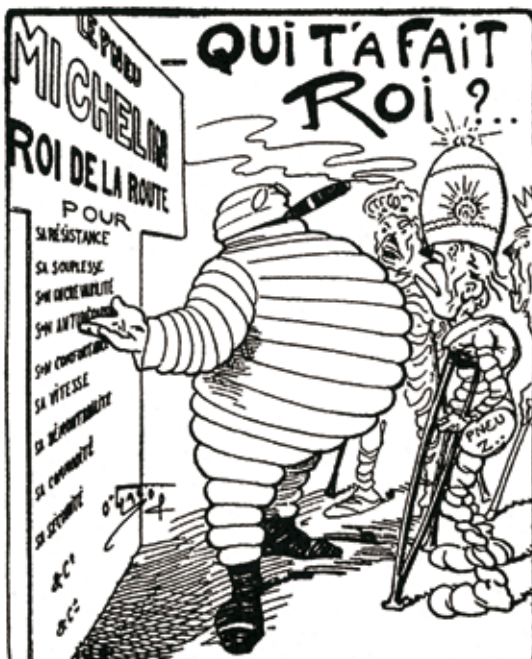
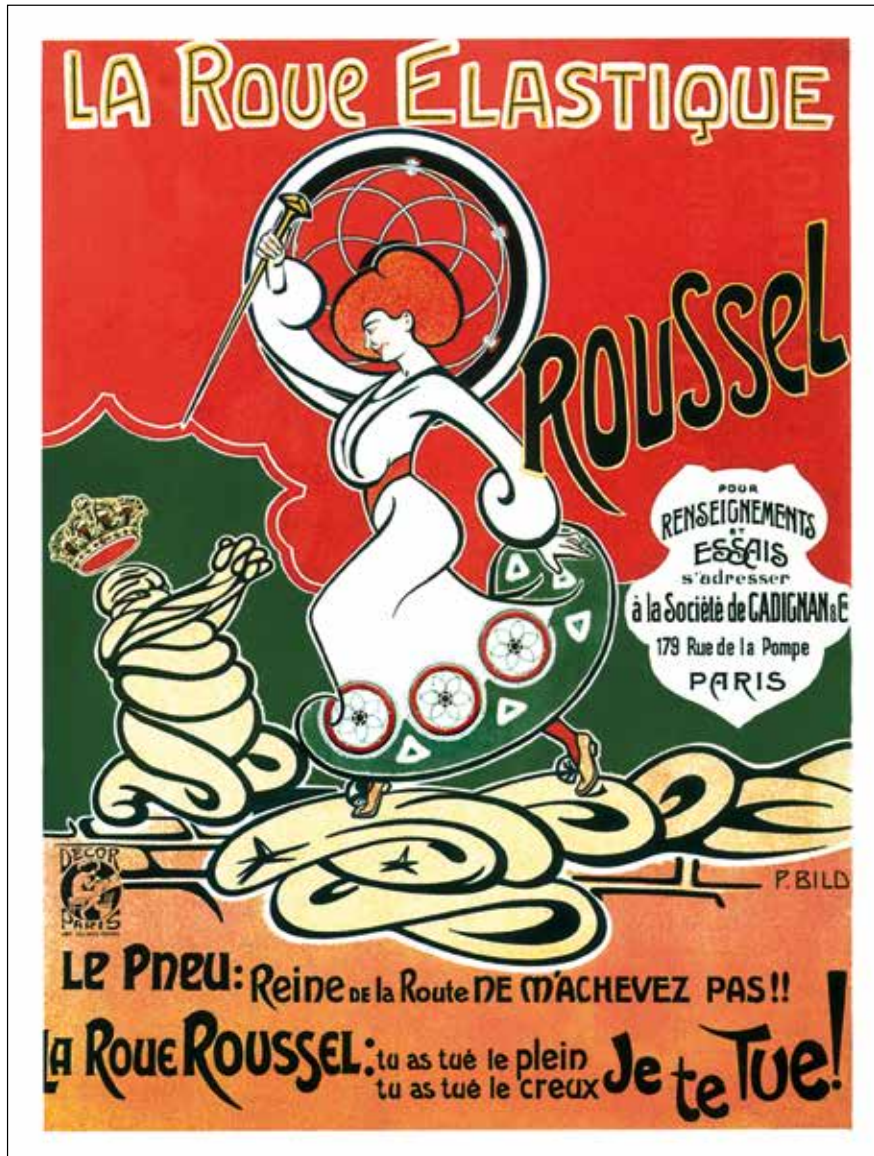
**La ROUE ÉLASTIQUE
" ROUSSEL "
c'est la LIBERTÉ!!**

**POUR ESSAIS ET RENSEIGNEMENTS
S^{TÉ} DE CADIGNAN ET C^{IE} - 179, Rue de la Pompe, PARIS**

1903 DE MONTAUT 179, Rue de la Pompe PARIS
S. Montaut

FREEDOM! [without equality or fraternity]. The Société de Cadignan et Cie., manufacturers of the Roussel spring wheel, tried to increase their share of the market with their novel proposal. In a widespread campaign, they sought direct confrontation with the top representative of the prevailing and firmly established pneumatic tire technology, Michelin. A desert setting is portrayed, with a line of automobile drivers appearing as prisoners of a group of slave traders embodied by the figure of the corporate mascot Bibendum. A warlike and liberating goddess transported by a Roussel wheel comes to the rescue of the chauffeurs. The illustration accompanies the poster's explicit motto: "The pneumatic tire is slavery! The Roussel spring wheel is freedom!"

14. Lithograph poster, c. 1903. Printing company Charles Wall & Cie, Paris. Illustrated by Ernest Montaut (1879-1909).



THE KING AND HIS NEMESIS.

“Le roi des tires” [King of tires] and its variant “Le roi de la route” [King of the road] was one of the mottos used in Michelin advertising at the beginning of the century. For this reason, the poster shown above depicts a crowned Bibendum kneeling and begging for mercy before the righteous Queen of the Road, the incarnation of the Roussel spring wheel manufactured by the Société de Cadignan & Cie. The dialogue of the scene is worth highlighting:

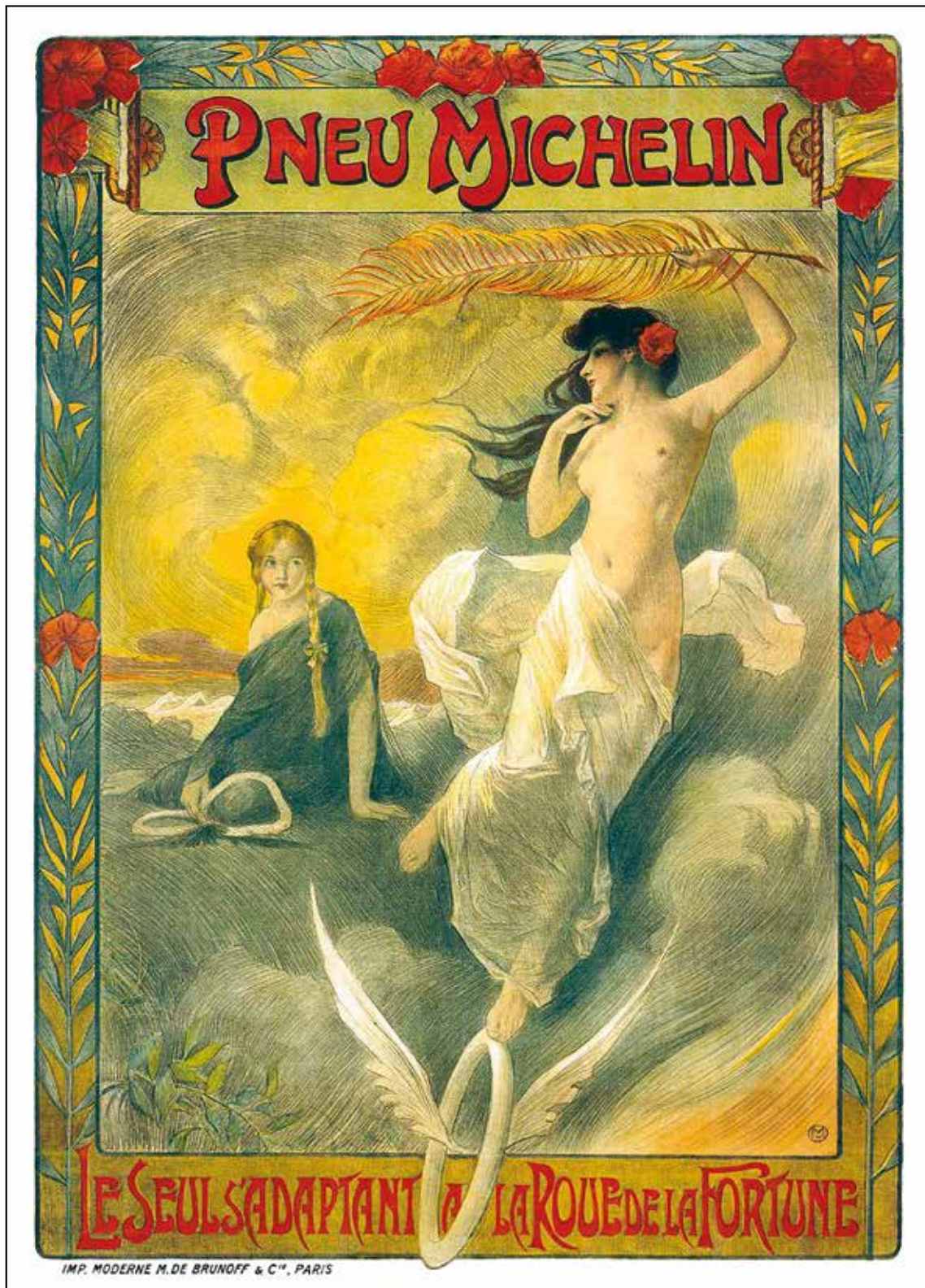
“The pneumatic tire: —Queen of the road, do not end my life!”

The Roussel wheel: —You have annihilated the solid and the empty void ... I’ll kill you!”

As in the case of the poster on the previous page, in which the republican motto of freedom is used, here we can also see a scenario used as an allegory to the French revolution, in which a made over Marianne confronts the Monarchical power.

15. Lithograph poster advertising the Roussel wheel, c. 1903. Printer Imprimerie des Petits-Frères from Paris. Illustrated by P. Bild.

16. Illustration number 3, “Qui t’a fait roi?,” From the series of postcards published by Michelin in 1905-1906 under the generic title *Mots historiques*. It shows Bibendum as King of the Road, elevated to that rank by his demonstrated virtues of resistance, being puncture proof and secure.



THE MICHELIN WHEEL OF FORTUNE. The above image is a poster for Michelin pneumatic tires employing the allegory of the Wheel of Fortune. In classical Roman mythology, Fortune was the goddess of luck, the embodiment of chance. Her main attribute was a wheel or roulette symbolizing the randomness of existence and the capricious nature of the human condition and destiny. The scene presents an exultant goddess riding on the Winged Wheel of Fortune while holding a palm leaf in her hand as a symbol of victory. Beside her, a nymph lies saddened and resigned because her wheel (an inner tube) is deflated and inert. This is a clear example of comparative advertising: the winner, of course, is equipped with Michelin tires.

17. Lithograph poster, 40 x 56 inches. Printed c. 1900 by Imprimerie Moderne M. de Brunoff & Cie., Paris. Illustrated by Michels.



ORIGINAL IDEA ... AND PARODY.

The illustrator Michels—probably a family member of the Parisian Imprimerie Michels et Fils—presented this first version of the Wheel of Fortune theme at a poster contest convened in 1899 by Michelin in the magazine *La Revue Parisienne*. This work won the award of 100 FF and a black and white publication in the magazine, with the Michelin company maintaining proprietorship. It is assumed that, under instructions by the tire manufacturer, the artist adapted the idea shown here to the poster portrayed on the previous page. The color poster was printed around 1900-1901 and signed with the monogram of the artist consisting of the initial 'M' circumscribed and underlined. On the left, illustrator Georges Meunier parodied the Michelin poster on the cover of the humorous magazine *Le Rire*, in June 1901. The legend at the foot of the picture depicts the scene and characters: "Luck inflating the wheel of Fortune, stung by Bad Luck, who flees." The Wheel of Fortune is equipped with the modern technology of the pneumatic tire. It may burst ... but it can also easily be repaired to continue rolling on.

18. Poster project published in the magazine *La Revue Parisienne*, November 1899. Illustrated by Michels.

19. Cover of the magazine *Le Rire*, June 15, 1901. Illustration by Joseph Henri Georges Meunier (1869-1942).

THE COSSET WHEEL (OF FORTUNE).

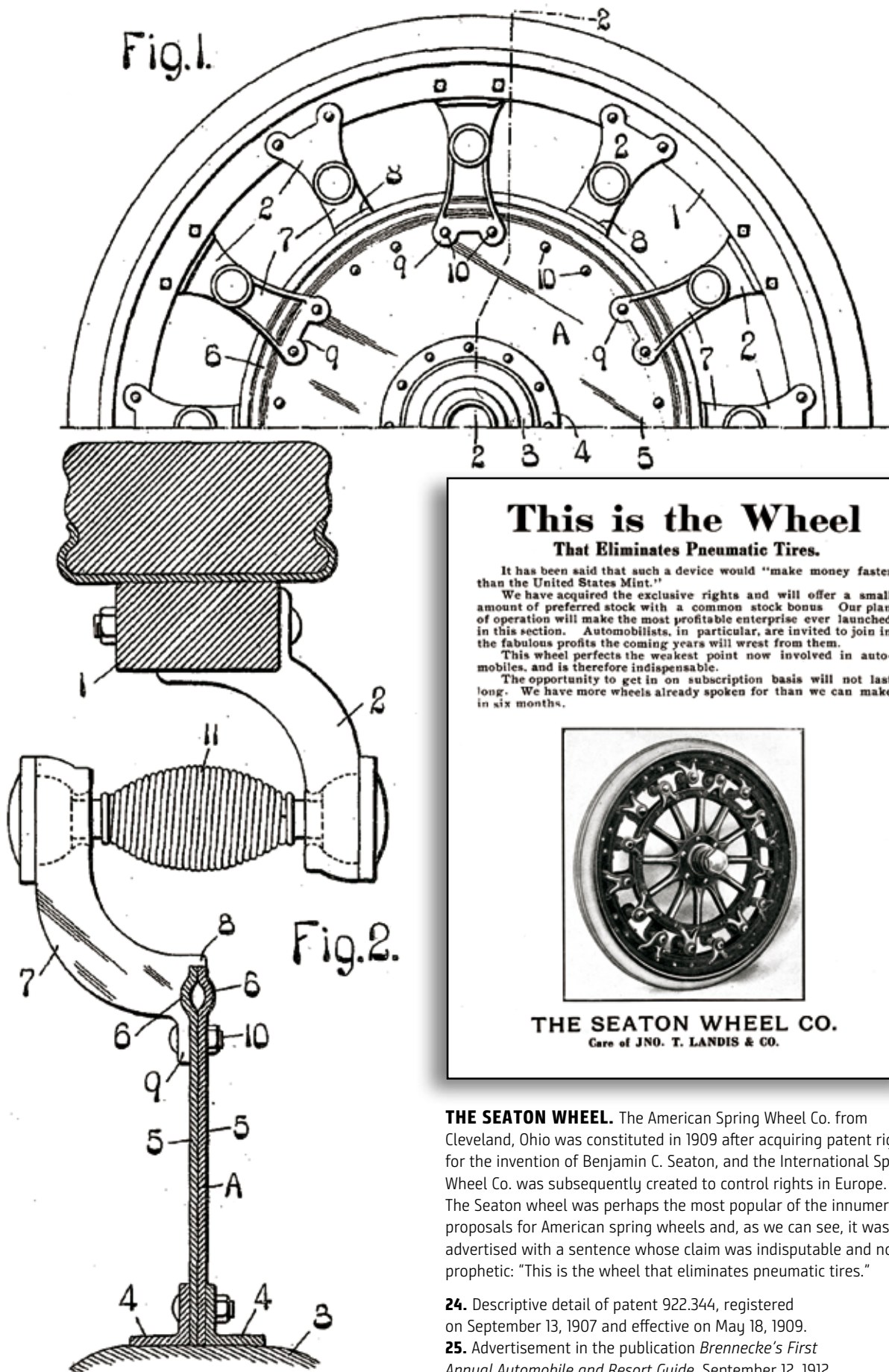
The publicity for the Cosset wheel took the baton from that initiated by their competitors, the Roussel-Cadignan spring wheel. Here it was also a question of disqualifying the pneumatic tire and indiscriminately blaming it for victims of serious accidents caused by flat tires during driving. In contrast, their product was graphically presented as an allegory of the goddess Fortune, replacing the winged wheel that transported her with her arm raised, wielding a palm leaf as a symbol of victory.

The engravings shown below are explicit. The scythe of death is split in half when confronting the Cosset wheel, while the adjacent vignette depicts an endless procession of crippled and injured "pneumatic tire victims."

20-23. In this double page, different illustrations extracted from the promotional brochure with price list for the French Cosset wheel, manufactured by the Société des Roues Élastiques a Jante Flexible, engravings signed by Éditeurs Alix et Cie, in Niort, c. 1906.







This is the Wheel
That Eliminates Pneumatic Tires.

It has been said that such a device would "make money faster than the United States Mint."

We have acquired the exclusive rights and will offer a small amount of preferred stock with a common stock bonus. Our plan of operation will make the most profitable enterprise ever launched in this section. Automobilists, in particular, are invited to join in the fabulous profits the coming years will wrest from them.

This wheel perfects the weakest point now involved in automobiles, and is therefore indispensable.

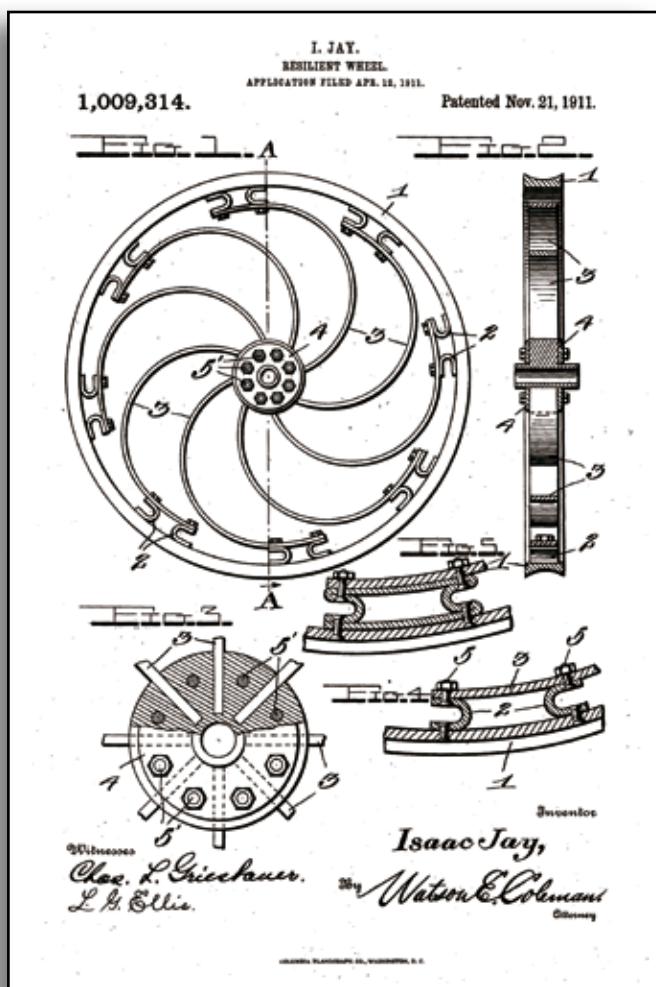
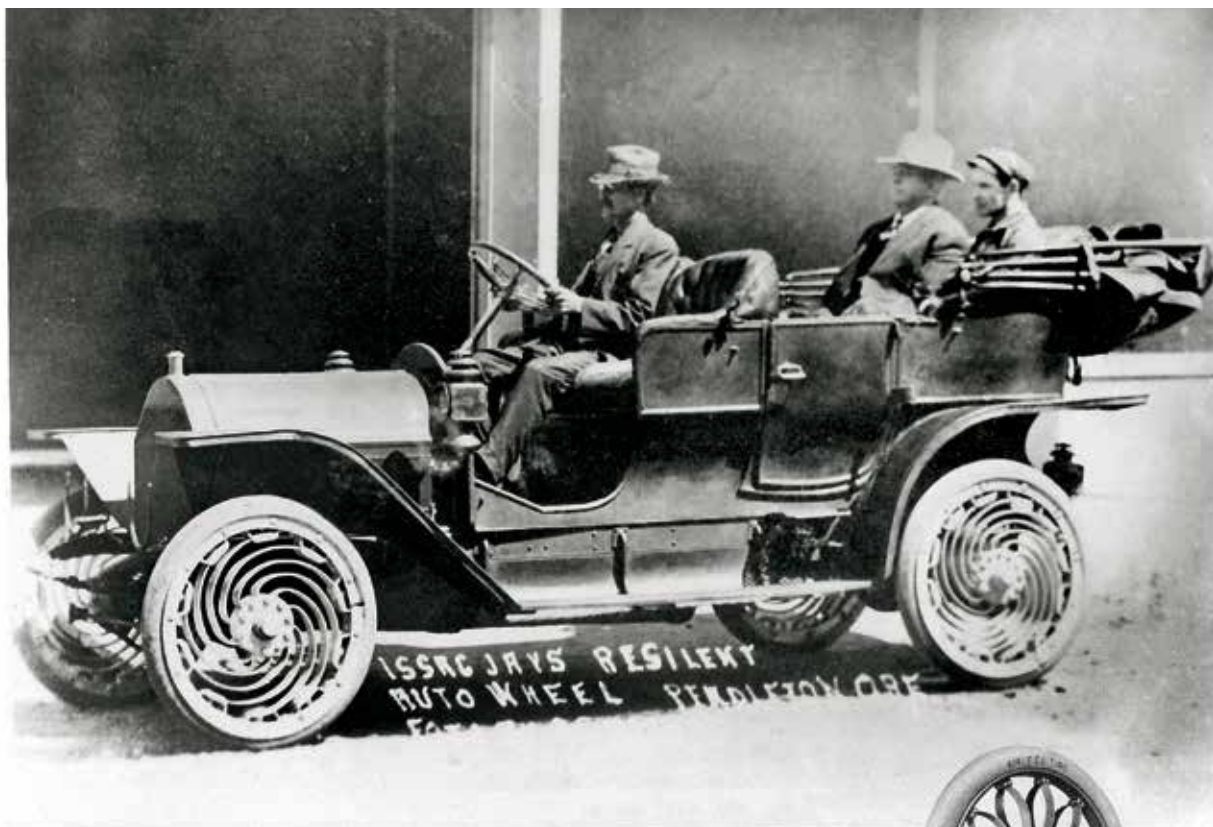
The opportunity to get in on subscription basis will not last long. We have more wheels already spoken for than we can make in six months.

THE SEATON WHEEL CO.
 Care of JNO. T. LANDIS & CO.

THE SEATON WHEEL. The American Spring Wheel Co. from Cleveland, Ohio was constituted in 1909 after acquiring patent rights for the invention of Benjamin C. Seaton, and the International Spring Wheel Co. was subsequently created to control rights in Europe. The Seaton wheel was perhaps the most popular of the innumerable proposals for American spring wheels and, as we can see, it was advertised with a sentence whose claim was indisputable and not prophetic: "This is the wheel that eliminates pneumatic tires."

24. Descriptive detail of patent 922,344, registered on September 13, 1907 and effective on May 18, 1909.

25. Advertisement in the publication *Brennecke's First Annual Automobile and Resort Guide*, September 12, 1912.



This Wheel



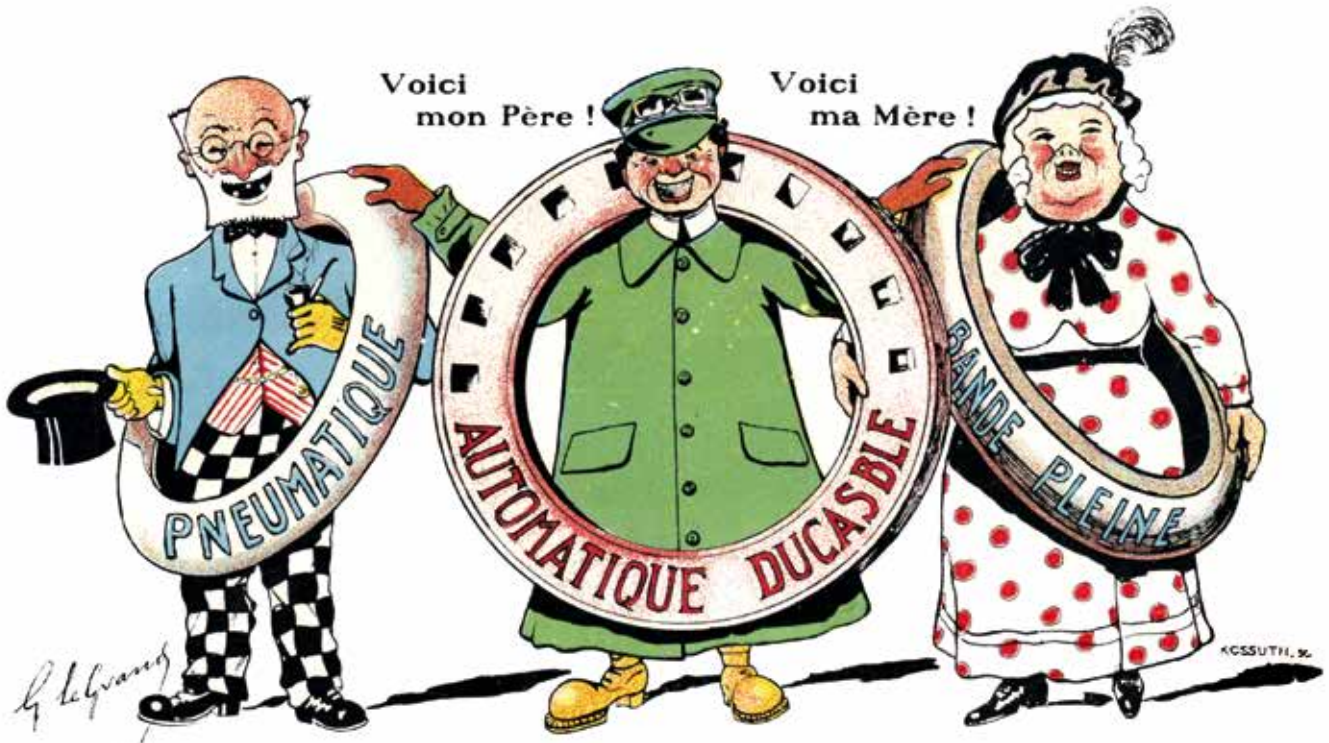
RESILIENT WHEELS.

The images above constitute two more examples of American spring wheels: an automobile equipped with "Resilient Auto Wheel" spring wheels designed with a spiral form, patented in 1911 by the inventor Isaac Jay, and another equipped with wheels of The Ideal Steel Wheel Company from Cincinnati, manufactured in 1913.

26. Photograph taken in 1912 in Pendleton, Oregon.

27. First page of U.S. patent number 1,009,314, entered on April 12, 1911 and effective on November 21 of that same year.

28. Fragment of an advertisement for The Ideal Steel Wheel published in *Motor* magazine, August 1913.



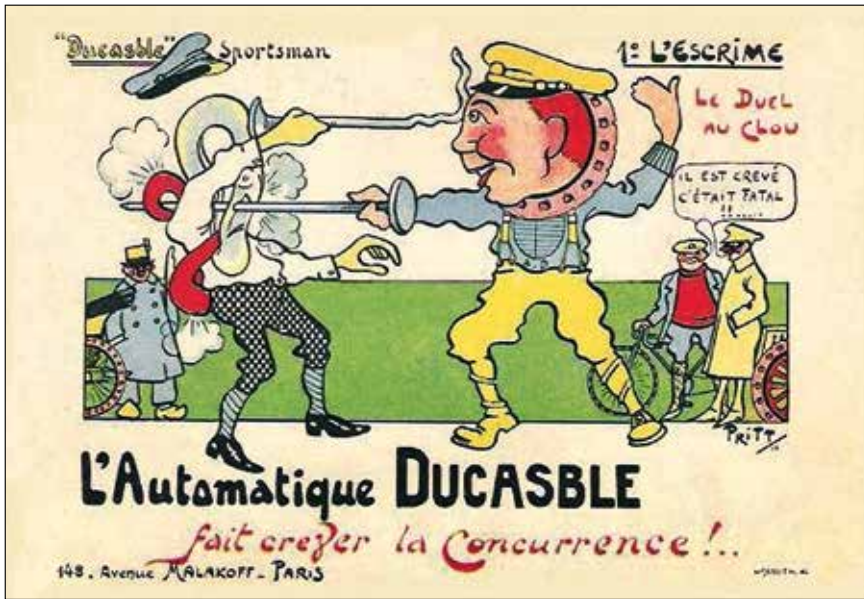
THE DUCASBLE TIRE.

As proposed by the allegory staged on the postcard shown above, the Ducasble cushion tire was the result of crossing the technological principles for the pneumatic tire—represented here as the father of the child—and those of solid rubber tires, personified as the mother. The real “father” of the Ducasble tire was Alfred Ducasble, photographed next to the car that, equipped with his cushion tires, participated in the endurance contest of April, 1908.

29. Advertising poster printed by Kossuth in 1912. Illustration signed by L. Legrand, probably Louis Legrand (1863-1951).

30. Photograph of a Ducasble tire with Alfred Ducasble. Rol Agency, April 1908.





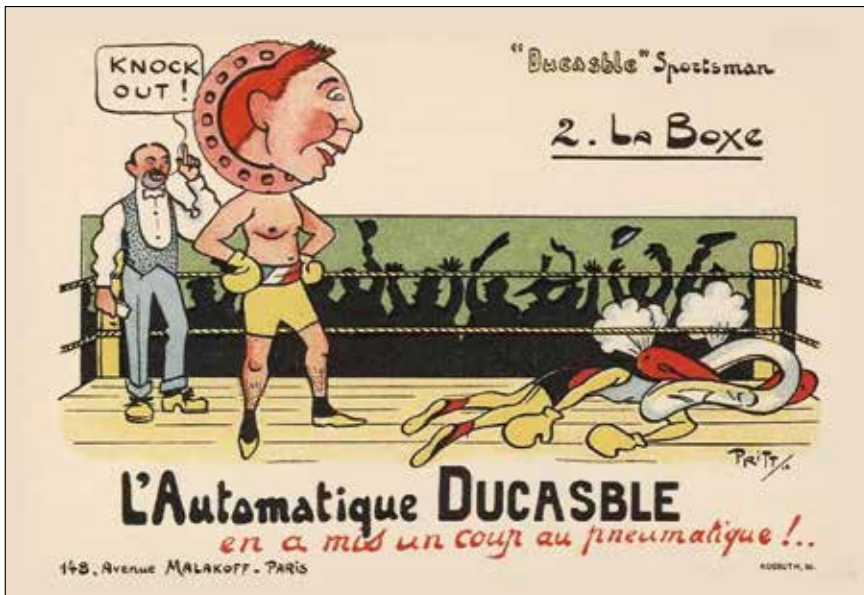
DUCASBLE ATTACKS!

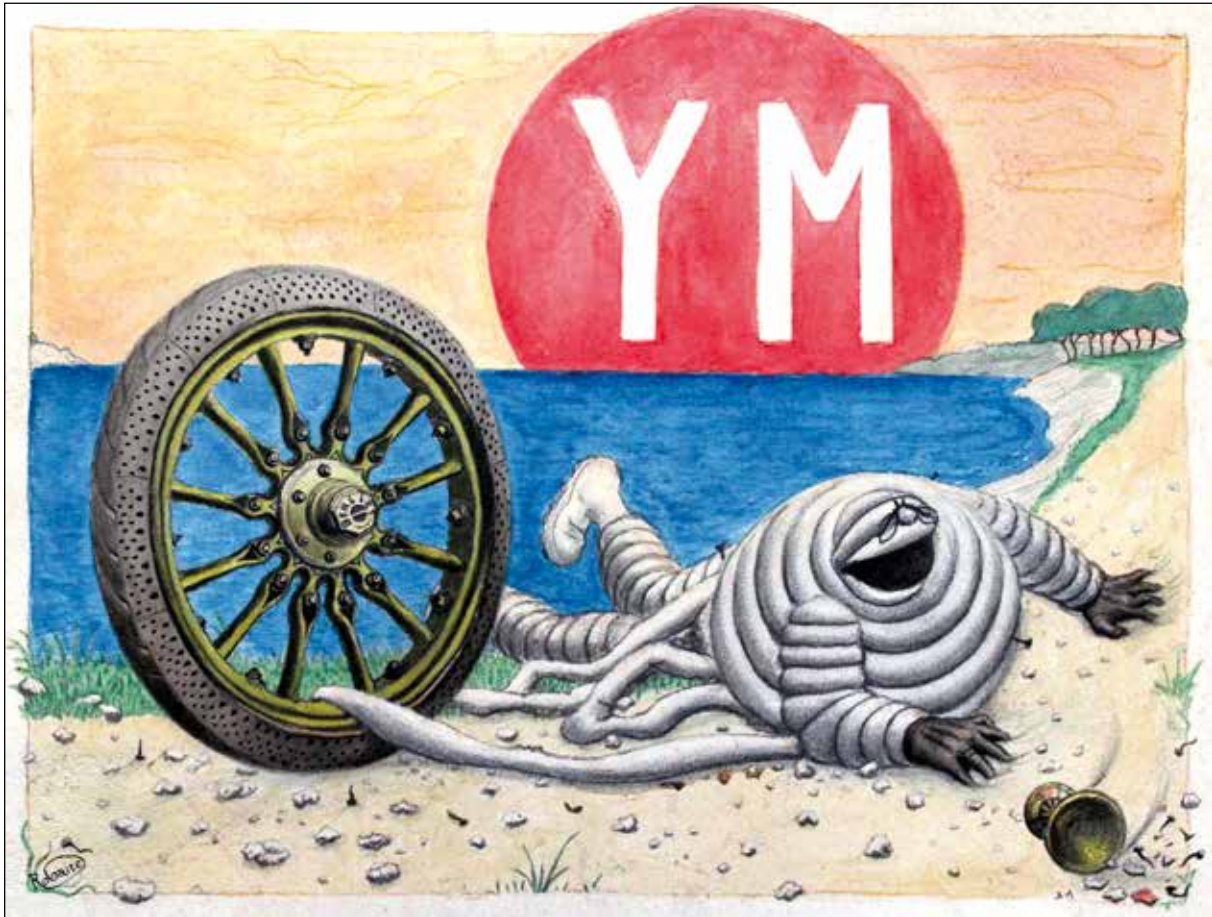
Returning to the crusade that the Roussel-type spring wheel had spearheaded against the pneumatic tire, The Société de l'Automatique Ducasble published in 1912 a series of postcards where this technology was challenged. The vignettes that were meant to be humorous were illustrated by Georges Pritt. They depict the confrontation in different sporting events between the athlete Ducasble and its opponent, a humanized pneumatic tire with a cover and red inner tube, who is irrefutably defeated.

31. Postcard number 1 from the series *Ducasble Sportsman* dedicated to fencing and with the motto "L'Automatique Ducasble punctures the competition."

32. Postcard number 2 from the series *Ducasble Sportsman* dedicated to boxing and with the motto "L'Automatique Ducasble gives a hard blow to the tire," probably referring to the famous phrase from the O'Galop poster "Le coup de Semelle" in which Bibendum appears as a boxer.

33. Postcard number 4 from the series *Ducasble Sportsman* dedicated to track and field and with the motto "L'Automatique Ducasble makes the tire collapse."





EVERYONE AGAINST BIBENDUM.

Following the example of the different manufacturers of the spring wheel —Roussel, Cadignan and Gosset—, in the advertisements for the cushion tire company MYG or YMG, formerly YM, they exemplified their supremacy in pneumatic tire technology positioning Bibendum as the adversary. In this case, Michelin’s spokesperson and mascot is depicted as being vulnerable, broken and defeated compared to the wheel equipped with the cushion tire.

34. Advertising project for YM wheels. Pencil and watercolor on paper, 25.50 x 34 cm. Dated by handwritten text on paper: November 10, 1907. Illustration by Robaire (?).

35. Full-page advertisement published in *Annuaire-Almanach du Commerce, de l'Industrie, de la Magistrature et de l'Administration, 1907*. Paris: Didot-Botin.

Bandages élastiques **YM**, très souples et increvables

Système

YBERTY & MERIGOUX

BREVETÉ EN FRANCE S. G. D. G. ET A L'ÉTRANGER

ROYAT-LES-BAINS (Puy-de-Dôme)

Montage sur Jante à Pneus

Montage sur Jante Spéciale

YM Bandage à **YM** etc. Éléments

Ces bandages réunissent tous les avantages du pneu et du plein sans en avoir les inconvénients; ces avantages se résument ainsi :

SOUPLESSE, INCREVABILITÉ, SOLIDITÉ, RÉPARATION INSTANTANÉE SUR LA ROUTE, MONTAGE SUR TOUTES LES JANTES A PNEUS

Pour Renseignements et Prix s'adresser à

MM. YBERTY et MÉRIGOUX, à Royat-les-Bains (Puy-de-Dôme).

La Roue Double **J.H.**
 c'est un
"MARIAGE DE RAISON"
 entre le **PNEUMATIQUE** et la **BANDE PLEINE**.

Elle évite le **DÉRAPAGE** et l'**USURE** rapide du Pneu.
 Elle évite la **PANNE**
 Elle évite un **ECLATEMENT** brutal.

Toujours elle Secourt le PNEU

J.W. & T. CONNOLLY (FRANCE) L^{td}
 Tel. 509 60 **J. HOFFMANN, Directeur**
 11, Rue Vernier - PARIS

"THE IDEAL" Rubber Tyre

There is but **ONE RUBBER TYRE** on the market which is absolutely right in every particular.

That's the **"IDEAL"**

J.W & T. CONNOLLY, LONDON, GLASGOW, DUBLIN & LEEDS.

A MATCH MADE IN HEAVEN.

The polarized dispute between the solid rubber tire and the pneumatic tire also had hybrid protagonists, such as the double wheel J.H, which fitted parallel rims with tires having both types of technology. The shock-absorption capacity of the pneumatic tire inner tube and the consequent comfort for the vehicle, the passenger and the cargo, was complemented by the safety provided by the solid rubber tire, avoiding blowouts and with less skidding. The combination of both typologies was employed by the illustrator Georges Pritt who elaborated through anthropomorphism a metaphor on the theme of marriage. The British company J. W. & T. Connolly Ltd., founded in 1852, specialized in the manufacture of parts and accessories such as wheels and solid and pneumatic tires, first for carts and later for motor vehicles. Their products were distributed in different European markets who were under Anglo-Saxon influence. In 1956 they were absorbed by a large company of the sector, the Avon India Rubber Co. The J.H. wheel was made available in French territory through their local branch, the Paris-based J.W. & T. Connolly (France) Ltd. and directed by J. Hoffmann.

36. Advertising postcard postmarked in 1912. Printed by Kossuth et Cie, Paris. Illustration by Georges Pritt.

37. Advertisement for Ideal brand solid rubber tires, published in a British magazine, September 1902.



The New Tire

The Lattina Cellular Tire

ends all tire trouble. Cannot be punctured. Requires no inflation. Always the same. Possesses the highest degree of resiliency. No leaky valves. Smaller than pneumatic, lighter than a solid tire, more durable and cheaper than either. For **Vehicles, Automobiles and Bicycles.**

THE RUBBER TIRE CO., Phila., Pa.
Samples shown and contracts made only by
LATTA & MULCONROY, 1215 Market St., Philada.

LATTINA CELLULAR TIRES

For Motor Cars

Are **STRONG**
RESILIENT
DURABLE
and
ECONOMICAL



All puncture troubles avoided
by their use

ALSO MADE FOR
BICYCLES

Write for our catalog A

**The Rubber
Tire Co.**

1215 Arch Street
PHILADELPHIA

"ENDS ALL TIRE TROUBLES"

THE LATTINA CELLULAR TIRE

THE
REAL
THING



For

Bicycles, Vehicles and Automobiles

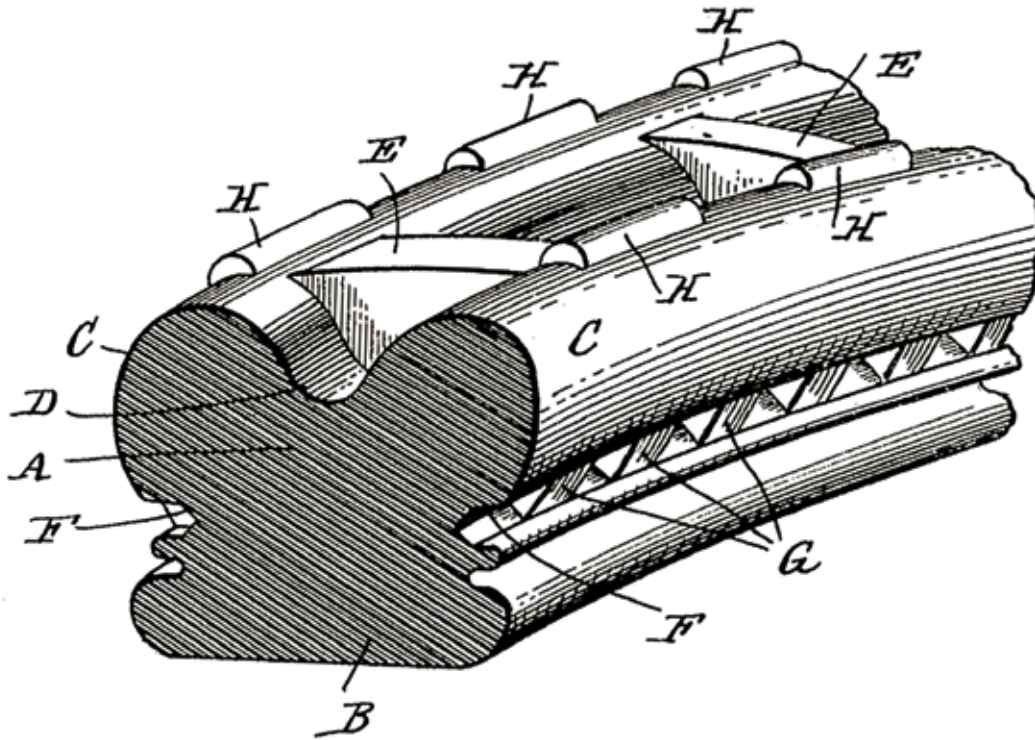
Cannot be punctured, needs no inflating. Elastic and most durable tire made. Smaller than pneumatic, lighter than solid. No valves. Always ready. This is the only tire which assures absolute freedom from puncture troubles.

THE RUBBER TIRE CO., 1215 Market St., Phila., Pa.

38. Advertisement for the cushion tire brand Lattina Cellular Tire, 1900.

39. Vertical advertisement for Lattina Cellular Tire, 1904.

40. Advertising module published in the *L.A.W. Magazine: Official Organ of the League of American Wheelmen*, March 1901.



MOTZ CUSHION TIRES. The above image is a cross sectional representation of Motz's tire tread, with different levels and an arrangement of rubber designed to obtain greater cushioning than that typically provided by solid rubber tires. Below, an advertising module with the slogan "The end of tire troubles" and an introductory text that assures: "Punctures, blowouts, patching, cement, extra equipment, big repair bills and a myriad of tire-troubles are abolished."

41. Descriptive detail of patent number 925,937, registered on July 31, 1908 and granted June 22, 1909.

42. Advertisement in *The Motor Age*, 1911. 43. Cover of the Motz catalog of cushion tires for electric cars, 1911.

The End of Tire Troubles

Punctures, blowouts, patching, cement, extra equipment, big repair bills and a myriad of tire-troubles are abolished. For the only trouble-proof tire of pneumatic resiliency has been achieved.

Note the illustration. Note the reasons Motz sales leaped nearly 1600% last year—because the sole United States patent on a combination of trouble-proof qualities and *resiliency* is embodied in the remarkable

MOTZ CUSHION TIRES

Ingenious *double-treads*, *undercut sides* and *slantwise bridges* add the resiliency of the properly-inflated pneumatic, traveling at moderate, *safe* speed. The *slantwise bridges give*, as does air in pneumatic tires.

And *Motz Cushion Tires* fill the automobile's greatest want—a *resilient*, trouble-proof tire.

The agency for *Motz Cushion Tires* is a splendidly profitable business. *Motz Tires* are built for gas cars, electric cars, taxicabs, commercial trucks, physicians' cars, etc. In fact they are made for all kinds of utility cars.

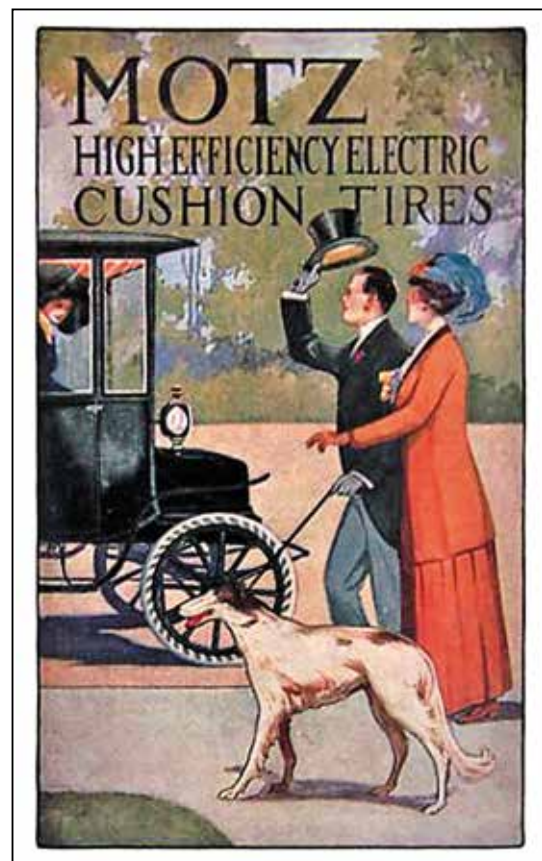
The *Motz* is quick-detachable. Write us today for Booklet 55, and special proposition to dealers, agents and garage men.

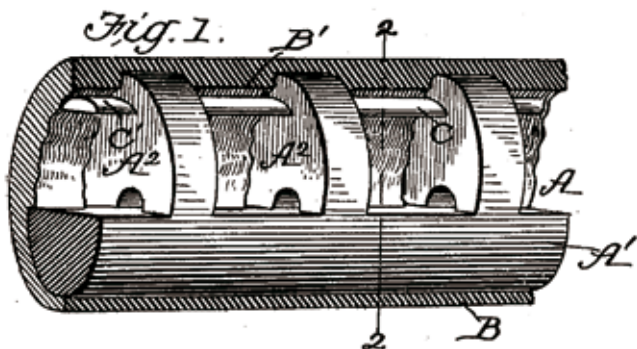
The Motz Tire and Rubber Company
Factories and Executive Offices:
AKRON, OHIO

BRANCHES:
New York, 1737 Broadway; Chicago, 2023
Michigan Ave.; Detroit, 966 Woodward Ave.;
Kansas City, 409 East 15th St.



Note the resiliency when
passing over a stone
(Drawn from actual photo-
graph.)





To the Sane Car Owner:—

You, who drive your own car and use it for business and the pleasure of your family — you can get entirely away from the dread of tire trouble by using



National Airless Tires

Thousands of people are using them and all swear by them, not at them. They cannot puncture or blow out. None have required retreading under 10,000 miles of ordinary road running. They cost but little more than pneumatic tires.



AIRLESS TIRE CO.
 806 West Washington St.
 INDIANAPOLIS, IND.

AIRLESS TIRE CO. Western Branch Rush and Pearson 318 Chicago	AIRLESS TIRE CO. Eastern Branch 102 4-6 W. Crain St. Pittsburgh
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- 44. Descriptive detail of patent number 691,589 for the Brooke Airless tire, inscribed on November 16, 1901 and finally granted on January 21, 1902.
- 45. Advertisement for National tires, published in the magazine *The Automobile*, December 30, 1909
- 46. Advertisement for Goshen tires, published in the magazine *Motor Age*, February 4, 1909.

Absolutely Trouble Proof

THE **GOSHEN AIRLESS CLINCHER TIRE**

More Mileage

Cannot blow out—cannot puncture—eliminates repair bills and delays on the road—rides as easy as a pneumatic and has all the good features of pneumatics without their defects—outward appearance is exactly like that of pneumatic tires and fully their equal in resiliency, yet will outwear several ordinary tires; will fit any standard clincher rim and is fully guaranteed.




Why Not Insure

your tires against punctures, rim cutting and blow outs and

YOURSELF

freedom from constant worry that something will happen to your tires to give you a disagreeable job of tire repairing on the roadside?

With Goshen Airless

you are relieved of all fear of tire troubles, and in addition cut down cost of tire maintenance.

It is better to buy good tires that will give long and satisfactory service their entire life rather than to buy cheaper tires and have continual trouble and expense.

Descriptive circular and prices mailed on application. Some good territory still open for progressive agents—write us.

GOSHEN TIRE & RUBBER COMPANY
GOSHEN, INDIANA

Western Representative—Trouble Proof Tire Co.,
 223 Rush St., Chicago.

May, 1905.

MOTOR

25



THE NEW FAWKES WAY.

THE OLD PNEUMATIC WAY.

THE MONARCH AUTOMOBILE COMPANY.

Chicago, Ill., March 9, 1905.
The Milwaukee Rubber Works Co.,
Cudahy, Wis.

Gentlemen: The best recommendation we can give your tire is to say that we shall equip all the machines, which we shall manufacture, with them, and we contemplate turning out 1,000 during 1905.

Yours truly,
MONARCH AUTOMOBILE CO.,
FRANK DUNNAN, Secretary.



KNOX AUTO COMPANY,

127 Wisconsin Street,
Milwaukee, Wis., April 1, 1905.
The Milwaukee Rubber Works Co.,
Cudahy, Wis.

Gentlemen: It is after a very careful and thorough investigation that I have words of praise and encouragement for your Fawkes indestructible Airless Tires. I am convinced that the tire wears well, rides very easy, and, above all, stands up and has no more tread than the pneumatic tire. We have sold to Mr. Danburg, Dr. Joice, Dr. Jermain, and others, all of Milwaukee, and have taken particular interest in these tires to see what the result would be. I find that there is no more vibration on the engine than there is from the inflated tires when properly pumped up, as they should be. We can honestly and conscientiously recommend Fawkes Tires.

Yours very respectfully,
KNOX AUTO CO.,
Per C. E. Golder, Mgr.

Tire Insurance Free

In other words, equip your machine with
Fawkes Indestructible Airless Tires
and you will be absolutely insured against "Tire Troubles"

NO PUMPING
PUNCTURING
REPAIR EXPENSES
FARMERS' BILLS FOR HAULING YOU HOME
WORRY OVER WHAT MAY HAPPEN
TIME LOST

"They Ride SO Easy"

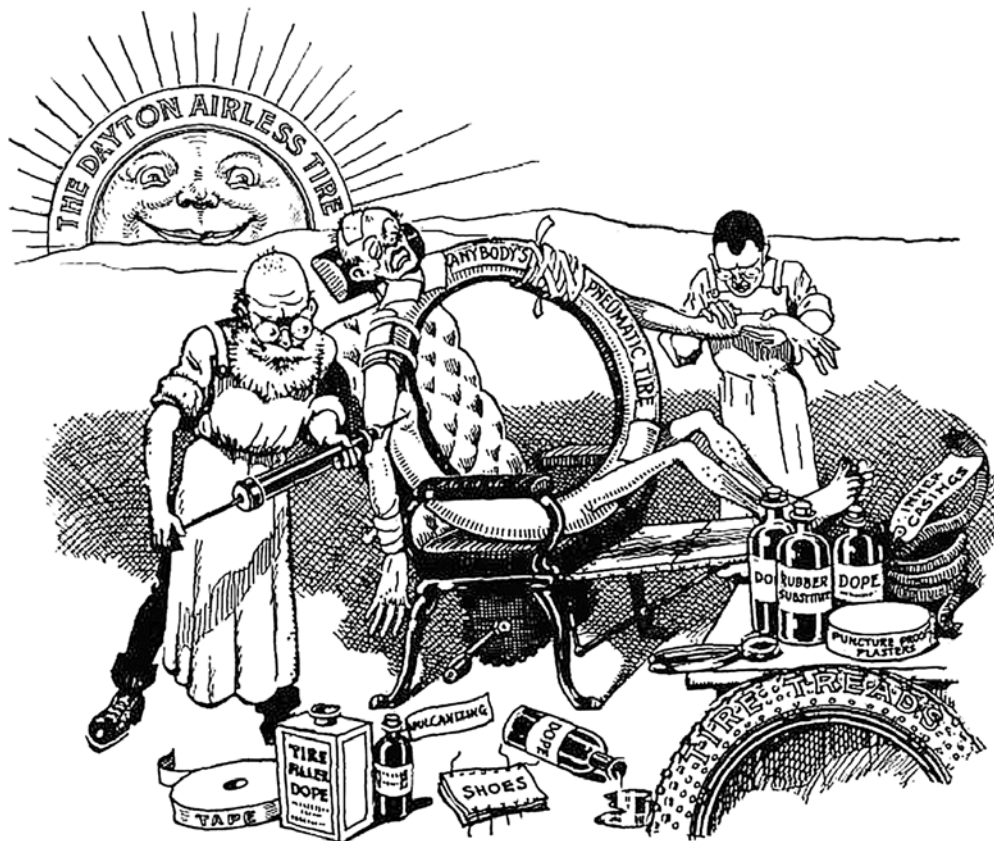
MILWAUKEE, Wis., March 18, 1905.
Fawkes Rubber Co., Cudahy, Wis.
Gentlemen—In reply to your letter of the 15th instant will say that I am well pleased with your 30 x 3/4 tires on my Knox machine. My car has been on the go every day this winter and the roads, as you know, have been frightful. The tires have stood the strain of the hardest kind of usage for over five thousand (5,000) miles and they appear almost as good as when they were new. I can say, too, that they are practically as resilient as the pneumatic tires and taken all together are much more desirable. In my estimation, a Knox Car equipped with the Fawkes Tires is certainly the combination for the doctor.
Yours very truly, P. H. JOSE, M. D.

After the most exhaustive tests and investigations we recently secured the "Fawkes" patent rights for the U. S. and unreservedly recommend these Tires as the **best on the market**, and will back them up with a liberal **Guarantee**. Send to-day for free illustrated booklet giving full particulars and testimonials.

Milwaukee Rubber Works Co. Mfrs. of Tires and Mechanical Rubber Goods
CUDAHY, WISCONSIN (Suburb of Milwaukee)

THE FAWKES TIRE. The above image is an example of testimonial publicity used for advertising the Fawkes Indestructible Airless Tire, which contains three letters sent by satisfied automobile dealers and customers to support the quality of the product. The heading, in a symmetrical composition, compares the safety provided by the new cushion tires against the danger of the damaged pneumatic tires utilized thus far.

47. Full page advertisement published in *Motor* magazine, May 1905.



THE DAYTON TIRE. The Dayton Rubber Mfg. Co. from Akron opted for an aggressive campaign against the pneumatic tire, not only accusing it of expensive maintenance—shown above, in a humorous tone—, but also of being a potential life-threatening danger for the driver and his family when traveling by road transport. As explained in the introductory text of the advertisement shown below, “No car on inflated tires is ever safe enough for you to trust with the lives of your family ... Can you afford to use pneumatics on your car, inviting injury and death on every ride? ”

48. Illustration of an advertisement in *Motor Age*, 1912. 49. Advertising module published in *The Automobile*, June 6, 1912.

No More Death Dealing Tire Experiences Like This

No car on inflated tires is ever safe enough for you to trust with the lives of your family. Tire explosions—hurling cars off the roadway, landing them upside down on top of the crushed passengers, or over embankments, or against rocks, telegraph poles or curbstones—are daily recorded in the roll of disasters due to the use of pneumatics.

Can you afford to use pneumatics on your car, inviting injury and death on every ride? You need not—for now science has done away with every excuse for using pneumatic tires.



The Dayton Airless Tire

The final triumph in tire making—buoyant resiliency and perfect riding ease without air! Soft inner column-like piers of elastic rubber support the Dayton Airless Tire and make any kind of tire trouble an absolute impossibility. This actually trouble-proof tire *cannot* explode—for it contains no compressed air. The supporting rubber columns alternate with free air spaces—and when an obstruction is encountered, these columns easily

and gently “give”, expanding into the open spaces on each side. As the obstruction is passed over, the columns recover to normal position without that air-rebound characteristic of pneumatics. Perfect resiliency and comfort, with absolute safety and freedom from any and every form of tire trouble—all that is yours when your car is equipped with Dayton Airless Tires.

Get the Dayton Airless Agency.

Dayton Airless Tires must supersede every other tire. The exclusive Dayton Airless Tire local agency will do the best and biggest tire business in your city. Men of first-rate qualifications and responsibility are invited to take quick action on this proposition. Telegraph us. Then write fully.



Write today for the Free Book—“The Air-Free—Care-Free Tire.” It answers every question you would ask.

THE DAYTON RUBBER MFG. CO.

100 KISER STREET, DAYTON, O.

C. J. CROSS & CO., Eastern Agts., 1878 Broadway, New York City.
 CHAS. P. JAEGER, Chicago Rep., 2123 Michigan Avenue, Chicago, Ill.
 THE DAYTON AUTO EQUIPMENT CO., Central Ohio Representatives, 5 East Second Street, Dayton, O.
 J. L. DULIN, Indianapolis Rep., 404 N. Capital Avenue, Indianapolis, Ind.
 E. LINGE, Kansas Representative, 123 West 5th St., Topeka, Kan.
 MERIDIAN SALES CO., Maryland, Virginia and District of Columbia Reps., 729 15th St., Washington, D.C.
 L. P. HORNBERGER, Pacific Coast Representative, Alaska Bldg., Seattle, Washington.
 COX & SORENSON, Oregon Representatives, 719 Chamber of Commerce Bldg., Portland, Ore.



THE SATURDAY EVENING POST 119

	<i>Bakeries</i>		<i>Utilities</i>	
	<i>Geometrics</i>		<i>Lawyers</i>	
	<i>Gas</i>		<i>Salesmen</i>	
	<i>Retailers</i>		<i>Truckers</i>	
	<i>Wholesalers</i>		<i>Builders</i>	

The Holes Go Clear Through
 This exclusive feature of Lambert "Trublpruf" Tires construction gives resilience approximating that of a fully inflated pneumatic. It is also the most successful method discovered for carrying off the frictional heat which shortens the life of ordinary tires.

THE BUSINESS TIRE

Adopted by truck and commercial car owners the country over because it gives uninterrupted service without upkeep cost.

Trucks and cars that roll on Lambert "Trublpruf" Tires get there and back on scheduled time. Deliveries are never interrupted by punctures or blowouts. Daily routes need not be shortened in anticipation of tire trouble.

Lambert Tires combine adequate resilience and exceptionally long life with this uninterrupted service. And there is no expense for tire upkeep or repairs. Whether for the delivery of pies or

paints, laundry or lumber, cream or concrete, ice or coal, farm produce or any other product, your trucks are only as dependable as their tires. Many representative concerns in every business have recognized this fact and are now equipped with Lamberts earliest.

We have condensed their experience into a brief folder entitled "The Evidence Rolls On." Business men will find it valuable. Address

LAMBERT TIRE & RUBBER CO., Akron, Ohio
*Originators of a Cushion Tire Built on a Demountable Rim
 Distributors in All Principal Cities*

LAMBERT TIRES

"TRUBLPRUF"

Lambert Tires are built in all standard demountable sizes. Changeover is as simple as putting on a spare. They are also press-on Lamberts to replace solid tires. Dealers are invited to write for the Lambert proposition.

THE LAMBERT "TRUBLPRUF" TIRE.

The above image shows the window display in the automobile accessory shop owned by Charles W. Draper in Washington D.C. In the arrangement we can see the two models of 1920 Lambert tires: on the one hand there are cushion tires with a single row of perforations—patent number 57,363 inscribed on April 24, 1920 and granted on March 15, 1921—, and on the other, the model with two rows is displayed—patent number 57136 inscribed on September 3, 1919 and granted on February 22, 1921. On the left, an advertisement shows the natural market for this type of hybrid technology employed by the pneumatic tire and the solid rubber tire, that of freight vehicles and passenger transport such as trucks, vans and buses.

50. Photograph of a window shop c. 1920.

51. Full-page advertisement published in *The Saturday Evening Post*, June 20, 1925.

A few "pointers" on
the
Hickory
TRADE MARK
Wheels.

The
Pioneer safety bicycle
with wooden wheels or rims. These
rims are made of selected white ash,
in one piece. Other makers have since
followed our lead and adopted wooden
rims on account of their strength lightness
and durability. But the "Hickory" leads.

POINT 1. This is a wooden
age.
POINT 2. Wood, as ap-
plied to bicycles,
has been our specialty for
years.
POINT 3. Profit by
our experi-
ence. Buy a
HICKORY.

POINT 4. Our frames are of
Columbia tubing,
the best that can be made.
POINT 5. Our bearings
have perfect ad-
justments and run easily.
POINT 6. The Hickory
as a whole is
as honest a wheel as
was ever ridden.

Finally, Pointers galore are con-
tained in our cata-
logue, which may be had
for the asking.

The
Hickory
stands at the
head of its
class.

Hickory
Wheel
SOUTH FRAMINGHAM
MASS.

SPOKE STRUCTURE.

Bicycle and wagon wheels were built using wooden structures, sometimes reinforced with metal hoops. Both materials were also used for the spokes, opting for wood when sturdy wheels were needed—such as large transport wagons—and for tension wires in cases when light wheels were required—indicated for vehicles that displaced little weight, such as bicycles and sulkies, one or two seated-carriages. The image above shows a bicycle wheel advertisement for the Hickory Wheel Company in South Framingham, manufacturing wheels from white ash wood.

On the right, a Kelly-Springfield advertisement for carriages and wagons with wooden spoke wheels.

52. Advertisement in *Century Magazine*, 1894.

53. Advertisement for Consolidated Rubber Co. (later Kelly-Springfield) in *Life*, January 17, 1907.

We do not
know how to make rubber
tires out of anything but rubber.
If we could leave out this important item
Kelly-Springfield Tires
would be cheaper than steel. If you've had
experience with tires that run dead and give out
instead of wearing out, then you know what
would happen to Kelly-Springfield Tires if the
amount of rubber was reduced, the quality cheap-
ened or the construction altered.

"Rubber Tired" is a little book that
all drivers will like. Sent free.
Consolidated Rubber Tire Co.
29 Pine Street, New York
Akron, Ohio



WIRE WHEELS

for SAFETY

WIRE WHEELS mean safety first, last and all the time. Axles may bend, tires may come off—but wire wheels cannot collapse. They come through skidding accidents or collisions practically undamaged. They make incidents out of what might be deadly accidents.

Strength is the reason for the safety of wire wheels. Steel is stronger than wood. Steel spokes are infinitely stronger than wood spokes.

Each of the wire spokes in a wire wheel is strong enough to stand a strain of 3200 pounds. Still more, the lateral or side strength of a wire wheel is far greater than that of a wood wheel. The triple spoke lacing in wire wheels provides a set of spokes to take up the strain from any direction.

Shown at the left is a wire wheel and a wood wheel after a swinging weight has struck each such a blow as would occur when a car skids into a curb. The wire wheel is practically intact while the wood wheel is hopelessly smashed—nearly half of its spokes broken, the wood felloe badly split—entirely incapable of supporting a load.

SAFETY is only one reason for specifying wire wheels on your next car or for putting them on your present car. Our booklet tells about the comfort, tire economy, quick change, and the many other reasons why many manufacturers of automobiles have made wire wheels standard or optional equipment. Write for this booklet today. It's free.

WIRE WHEEL CORPORATION OF AMERICA
(Successors to Hook Manufacturing Co.)

Factories: BUFFALO, N. Y., and SPRINGFIELD, MASS.

Direct Factory Branches and Service Stations:
NEW YORK, 815 Eleventh Ave. at 77th St. CHICAGO, 2841 and Indiana Ave.
PHILADELPHIA, 125 South Broad St. LOS ANGELES, 1013 S. W. 7th St.
SAN FRANCISCO, 1243 Van Ness Avenue

WIRE WHEELS

WARNING TO THE TRADE

THE predominating wire wheel patents, which include the Rudge-Whitworth, Dunlop, Cowles, Duffy and House patents, are owned or controlled by the Wire Wheel Corporation of America, maker of the Houk and House wheels.

Licenses under these patents have been granted solely to the following manufacturers of wire wheels:

Standard Roller Bearing Company
Philadelphia, Pa.
(Maker of the Rudge-Whitworth Wheel)

Hayes Wheel Company
Jackson, Michigan
(Maker of the Hayes Wheel)

Dayton Wire Wheel Company
Dayton, Ohio
(Maker of the Dayton Wheel)

The use or sale of wire wheels made by manufacturers other than the above which embody any of the inventions covered by these patents, constitutes infringement and all those interested in such use or sale are liable as infringers.

Dealers, purchasers and users of wire wheels are absolutely safe against such liability only if the wheels are made under these patents either by the Wire Wheel Corporation of America or by its licensees.

WIRE WHEEL CORPORATION OF AMERICA
BUFFALO, N. Y.

Branches: New York, Philadelphia, Detroit, Chicago, Los Angeles and San Francisco

Canadian Representatives: The Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.

MONOPOLY. The control exercised by the company Wire Wheel Corporation of America over the principal British and American patents involved in the manufacture of wire-spoke wheels affected the rest of their competitors. The company became the main advocate for this type of technology, although their strategy for diversification led to the creation of divisions dedicated to other types of developments, such as disc wheels.

54. Full page advertisement published in *Motor World* magazine, November 28, 1917.

55. Advertisement warning the industry about the validity of manufacturing patents, published in the motor sector magazine *World Automobile Trade Journal*, March 1919.

PASCO WIRE WHEELS

have 3 Exclusive Patented Features in which lies the Secret of their Lightness, Dependability, Utility and Beauty



PASCO

The three exclusive Pasco features are of tremendous importance because they affect the entire wheel—make it stronger, more enduring, easier to change and more economical.

(1) **The Web**—All spokes in the Pasco Wire Wheel show four other spokes against two or three crossed spokes in other makes. This forms a double web which is stronger than in any other wire wheel and 50% stronger than wooden wheels. This distinct improvement is made possible by the patented four series Pasco method of Rim Punching and Spoke Lacing.

(2) **The Hub Cap** is made of a strong, indestructible metal that stands up perfectly in collisions, due to crowded traffic conditions, where aluminum, brass and other soft metal compositions will strain or break. It is sturdy, resistant to locking, yet attractive.

(3) **The Safety Locking device** absolutely prevents the wheel from working loose or coming off from a



The tire saving qualities of Pasco Wire Wheels, their lightness, their shock absorbing construction, the speed and ease with which they can be replaced on the road—all these factors make for genuine economy in upkeep cost and a saving in time and trouble.


The tire saving qualities of Pasco Wire Wheels, their lightness, their shock absorbing construction, the speed and ease with which they can be replaced on the road—all these factors make for genuine economy in upkeep cost and a saving in time and trouble.

Pasco Wire Wheels give to a car an air of distinctiveness and beauty and an impression of speed and flow which will appeal to all motorists.

Dealers—Write for particulars and prices and our liberal proposition to you.

NATIONAL WIRE WHEEL WORKS
Incorporated) GENEVA, N. Y., U. S. A.

March 6, 1919 MOTOR AGE 93



PASCO WIRE WHEELS are ECONOMICAL, too

Pasco Wire Wheels have always been known for their elegance and beauty of design, but back of appearance are the sturdy qualities that have given them the pre-eminent place they occupy today. Such qualities as strength, safety and economy mean real service to the owner and a confidence in performance that the most exacting road conditions cannot shake.

Owners of Pasco Wire Wheels know that they give increased tire mileage and that their lighter effort is saving in gasoline and means less wear on both motor and springs.

Pasco Wire Wheels maintain the standard 36-inch road tread making it easy to drive over rough and rocky roads without the continuous scraping on the sides of the tires. This standard tread also brings the line of load over the bearings which is important from an engineering standpoint.

Then there are numerous other features such as the Safety Locking Device which securely locks the wheel to the axle, and the Indestructible Hub Cap—all of these give the driver real value arguments, the fundamental reasons for purchasing Pasco Wire Wheels.

Yes, Pasco Wire Wheels will sell as beauty alone but the real value lies in their economy and unmatchable performance.

Dealers will receive detailed information upon request.

NATIONAL WIRE WHEEL WORKS, Inc. Geneva, N. Y.



PASCO

Pasco Wire Wheels Are More Than Beautiful — They Are Strong, Safe, Convenient and Economical.

The large demand for Pasco Wire Wheels is based chiefly on their beauty and quality. Car manufacturers, dealers and motorists in increasing numbers are choosing their appreciation of the remarkably handsome appearance of Pasco equipped cars.

Beauty and quality, however, are not the only advantages of Pasco equipment. It is well not to lose sight of the numerous exclusive mechanical features which give Pasco Wire Wheels their exceptional strength, safety, convenience and economy.

It is well to remember, too, that Pasco Wire Wheels can be interchanged with wood wheels without sacrificing the standard 36-inch road.

It will pay you to know about Pasco Wire Wheels.

National Wire Wheel Works, Inc.
General Sales Offices:
418-417 Bank Bldg. Detroit, Mich.
Plant No. 1, Geneva, N. Y. Plant No. 2, Hagerstown, Md.
Manufactured Canada The Northern Electric Co. Ltd.

PASCO WIRE WHEELS

BEAUTY AND UTILITY. In 1916 National Wire Wheel Works Inc., based in Geneva, New York, was established. At the end of that year they acquired patents and machinery of the Zarth Company in Aurora, Illinois, which had been producing a detachable wire-spoke wheel model. The machinery was moved to Geneva, and in 1917 they began production of the new Pasco Quick-Change Wire Wheels. In 1919 manufacturing moved to the new plant in Hagerstown, Maryland, and the central sales headquarters to Detroit, near the production centers for much of the automotive industry.

- 56. Two-page advertisement published in *Motor World* magazine, January 16, 1918.
- 57. Advertisement in *Motor Age*, March 6, 1919. 58. Advertisement in *Motor World*, September 24, 1919.

Grant Wire Wheel
Blazes a New Economy Trail

Makes the fifth wire wheel unnecessary. ONLY Wire Wheel made to fit the axle of any make of car.

ONLY Wire Wheel made to fit any Demountable Rim.

Eliminates the intricate parts that are necessary to build up and lock all other types of wire wheels.

ONLY Wire Wheel which cannot under any circumstances be thrown from the axle.

Replaces the wooden wheels using the SAME bearings and SAME method of attaching as the wooden wheels and the same demountable rims.

DEALERS: Demand of your factory that they furnish Grant Wire Wheel equipped cars.

MANUFACTURERS: Standardize your wheel equipment with the Grant and reduce equipment cost and labor.

Get some straight-from-the-shoulder wire wheel facts—send at once for our booklet "WIRE WHEEL WISDOM."

Grant Wire Wheel Mfg. Co.
Dept. 5, 28 East Jackson Boulevard
Chicago, U. S. A.

STANWELD
Wire Wheels for FORD Cars

\$20  **\$20**

A TREMENDOUS increase in our production of wire wheels enables us to reduce the price on complete sets for Ford cars to \$20 for the plain clincher type, and \$27.50 for the quick-detachable type.

It is possible to retail them at \$20 per set. Stanweld Wire Wheels cost nothing to apply. They give the car a beautiful appearance. They increase riding comfort, and decrease tire expense.

Every dealer in this country should be able to sell a number of sets. Write today for discounts.

Stanweld Wire Wheel for Ford Cars—Light, Simple, Strong



The Standard Welding Company
Edgewater Park, Cleveland Distributors in Principal Cities

DAYTON
QUICK DETACHABLE
WIRE WHEELS
MADE UNDER LICENSE

For Ford Cars
QUICK CHANGE

Five detachable and interchangeable wheels and four inner hubs make a set. Unwinding and replacing the hub cap is all that is necessary to change the wheels. The spare wheel may be carried with tire inflated, ready for instant mounting. When the demountable studs on steel rim will separate the quick change feature of Dayton Wire Wheels.

ECONOMY


A \$1000 auto has become a \$700 auto now when equipped on Dayton Wire Wheels. This is due to both economy and the remarkable tendency of the "Dayton." Fastened in any demountable.

DEALERS AND JOBBERS

There are excellent profit possibilities in Dayton Wire Wheels. Get your share of the profits.

DELIVERIES AT ONCE!

THE DAYTON WIRE WHEEL COMPANY, Dayton, Ohio



DAYTON
QUICK DETACHABLE
WIRE WHEELS

ARE YOU SECURING WINTER BUSINESS?

Many Sedan and Coupelets will be sold this winter that in any previous year. What does this mean to you, Mr. Dealer? It means that any accessory which adds to the length of winter, safety or attractiveness of these cars is going to be in big demand. Dayton Wire Wheels appeal to the automobile owner because of the wonderful practicality which gives 25% more tire mileage and lengthens the life of the car proportionately. The quick change feature of "Dayton" converts a delicate wheel of steel to the hard steel, as well as a matter of seconds when a tire change becomes necessary in snow weather.

Strength and Safety

"Dayton" are five times as strong as wooden wheels and will not collapse under the most violent impact caused by skidding on slippery streets. The beautiful design of "Dayton" gives the best results of elegance to the Lincoln or Chrysler. Every closed car comes in a big group for Dayton Wire Wheels. There are wonderful sales opportunities in "Dayton" winter rims.

Deliveries Now!

Dayton Wire Wheels will be on exhibition at the Ames Show, Chicago, during the Chicago Automobile Show.

The Dayton Wire Wheel Company
416 Miami Road, Dayton, Ohio



WHEELS FOR YOUR FORD. The appearance of affordable Ford models boosted the wire-spoke wheel industry, with some companies offering products exclusively made for that market, such as the economic Stanweld Wire Wheels or the more extensively utilized Dayton Wire Wheels from Dayton, Ohio.

59. Advertisement for Grant wheels published in the monthly *Automobile Trade Journal*, September 1917.

60. Advertisement for Stanweld wheels published in *Automobile Trade Journal*, July 1914.

61-62. Advertisement for Dayton wheels in *Motor World*, November 28, 1917 and January 16, 1918.

KOL-BEN

THE DOUBLE-LOCKED WIRE WHEEL

Win a Big Commercial Equipment

United Fuel Company, Detroit, Equips Its Whole Fleet with Our Wire Wheels After Exhaustive Test

The company wanted efficiency, unswerving wheel durability, and the distinctiveness of splendid wire wheel equipment. It cost money—lots—then competitive wire wheels—but the United Fuel Company knew only the best and most rugged wheels could stand the strain of continuous commercial service. Therefore

KOL-BEN WIRE WHEELS WON



Part of a fleet equipped with Kol-Ben-Wheels

These Wheels Will Put You Right With Your Trade



The best wheel in the world is of no use unless it is strong enough to stand the strain of the road. The Kol-Ben wire wheel is the only one that is strong enough to stand the strain of the road.

They Are Crack Reposers

Everywhere a set is sold it operates immediately to correct wear. The Kol-Ben is the best reposer in the wheel business.

Dealers who sell—who don't simply keep stores—can make splendid quick profits with this improved reposer unless will make these profits continuous.

The proposition is as fine as the wheel—write for it now.

The sales possibilities of Kol-Ben Wheels are unlimited—and the best sale is all that's necessary.

Write the nearest Kol-Ben representative for a copy of the literature. You will find it contains all the facts you need to know about the Kol-Ben wire wheel. It is a complete and up-to-date reference on the subject of wire wheels.



KOL-BEN WHEEL CO., Inc. Cadillac, Mich.

KOL-BEN

THE DOUBLE-LOCKED WIRE WHEEL

Combines Beauty With Commercial Utility

THEIR equipment of the Parlane Company of Detroit must be distinctive and beautiful. Dealers in highest class feminine attire, they cannot afford a single jarring note in their efforts to suggest elegance to their fair customers.

But they are business men, too. They realize that trivial decorations and gingerbread work are not only cheaply imitative but they are destructively expensive.

So, when they decided to equip all their beautiful delivery cars with wire wheels, they were influenced by neither name nor price—"What is the best—the strongest as well as the best looking?" — They tried them all—and

AGAIN KOL-BEN Wire Wheels WON



Another fleet being equipped

KOL-BEN Wheels will win in every test



Test all wire wheels for both beauty and strength; check them all over to see which combination shows the greatest durability and the longest life. Then you will find that the Kol-Ben Wire Wheel is a few steps beyond the best of its competitors and you will see for yourself why the United Fuel Co. and the Parlane Company, both of Detroit, decided to equip throughout with Kol-Ben Wheels.

These wheels offer dealers an excellent opportunity. Write at once for 1920 literature and see the plan.

There are no more competitors in the wire wheel business. Kol-Ben wire wheels are the only ones that are strong enough to stand the strain of the road. They are the only ones that are beautiful enough to attract the attention of the customer. They are the only ones that are economical enough to give you a profit on every sale.



KOL-BEN WHEEL CO., Inc. Cadillac, Mich.
EXPORT DEPT., AUTOMOTIVE PRODUCTS CORP., WOOLWORTH BLDG., NEW YORK CITY

SIMPLEX Wire WHEELS

Satisfaction Plus

THE constantly increasing demand for Simplex Wire Wheels for Ford cars means just one thing—they satisfy in every particular. They are a combination of exceptionally good looks, unequalled sturdiness, and, for reason of their construction, they contribute heavily to economy.

The prospective buyer of wire wheels can have no conception of the superiority of Simplex Wheels unless he sees them. Then he will appreciate why every owner will have no other.

The patent lock—a self-contained unit, locking at any point as a unit—makes them desirable even for ladies to handle. There is no effort in the attachment of a spare wheel if it is a Simplex Wheel.

Dealers and Jobbers: You will stimulate business right now by showing Simplex Wire Wheels. They require no effort to sell. Car owners are half sold on their appearance; the locking feature closes the sale. We are allowing great year's territory. Write at once for our special new-business offer.




Simplex Wire Wheel Corporation
Cadillac, Michigan

SIMPLEX Wire WHEELS

Never Disappoint

The primary appeal in Simplex Wire Wheels is to the eye—the wheels improve the appearance of any car to which they are attached.

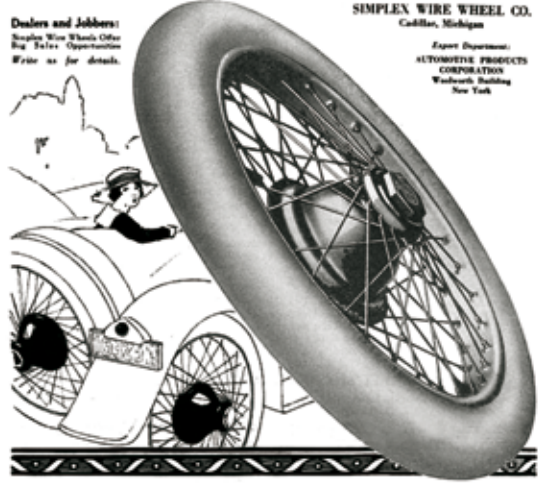
The real appeal—the one that has the greatest value to car owners—is in the Simplex lock, which is self-contained, locks automatically at any point, on and off as a unit, and the only tool required is a wrench.

Simplex Wire Wheels fulfill every requirement. The combination of grace, stamias, beautiful finish and ease of handling make them an investment paying handsome returns to the user.

SIMPLEX WIRE WHEEL CO.
Cadillac, Michigan

Export Department:
AUTOMOTIVE PRODUCTS CORPORATION
Woolworth Building
New York

Dealers and Jobbers:
Simplex Wire Wheels Offer Big Sales Opportunities
Write us for details.



SUCCESSORS. The Kol-ben Mfg. Company from Cadillac, Michigan, was established on June 26, 1917 to manufacture detachable wheels, preferably being wire spoked. In the middle of the 1920s their name changed to Simplex Wire Wheel Co.

63-64. Advertisements for the Kol-Ben Wheel Co. in *Motor Age*, January 1 and February 19, 1920.

65-66. Advertisements for Simplex in *Motor Age*, October 14, 1920 and in an unidentified magazine, 1920.

**Salisbury Improved Artillery
Wood Wheels**



Our new plant with capacity of 200 wheels per day, all new machinery and expert mechanics, assures you a true wheel, perfect in every respect, latest in design and prompt delivery. We answer your correspondence at once.

Salisbury Wheel & Mfg. Co.

New Location:
4 Tiffany Ave.
JAMESTOWN, N. Y.

Notice Ribs on Flanges.
Protected by letters patent

ROBUST WHEELS. The wooden wheels and thick spokes of the same material soon became a standard for equipping heavy motor vehicles, in the image and likeness of those used for carriages and wagons.

67. Advertisement for Salisbury in *Motor Age*, October 1, 1903. 68. Imperial's advertisement in *The Horseless Age*, June 24, 1903.

69. Advertisement for Schwarz published in the motor sector's monthly magazine *Cycle and Automobile Trade Journal*, April 1905.



**THE
"IMPERIAL"
WOOD
ARTILLERY
WHEELS FOR
AUTOMOBILES**

**The Strongest and
Most Perfect
Wheel Made.**

**BALL and ROLLER BEARING.
Also KEY SEATED WHEELS.**

*We are prepared to make all kinds of
Automobile Wheels from Strictly Second
Growth Hickory.*

Send for **ILLUSTRATIONS and PRICES.**
Every Wheel Guaranteed.

IMPERIAL WHEEL COMPANY,
Flint, Michigan, U. S. A.

The Schwarz Wheel

**THE STRONGEST ARTILLERY
WHEEL IN THE WORLD**



PATENTED
FINISHED WOOD WHEEL

The spokes are put together without a hub, under pressure, the spokes interlocking one another. Being the same width in the center of the hub as on the outside, they cannot loosen. For the same reason the tenon of this spoke is longer than that of any other, permitting the use of a hub of a smaller diameter, yet still retaining the same spoke support

**THE CONSTRUCTION OF THIS WHEEL
INSURES ITS BEING PERFECTLY TRUE**

The hub flanges are not required while making the wheel or applying the tire; they can be put on easier after wheel is finished, thus making the hub come true with the tire.

These wheels are made with any number of spokes, straight or with any dish desired.

When hub flanges are bolted on they have the same appearance as any other artillery wheel

THE SCHWARZ WHEEL COMPANY
Factory, 26th and Glenwood Ave. Office, 135 N. 12th St., Philadelphia

NOTE THE WOOD WHEELS EVERYWHERE

Where WOOD Wheels *only* could be used

Not only must field artillery wheels have the excessive strength to stand severe shock—
They must be resilient. They must take up all road vibrations.
The modern field howitzer has no spring suspension, no rubber tires. Its delicate mechanism while traveling is protected solely by the shock-absorbing qualities of its WOOD Wheels.
Wood, with its tough, fibrous texture, is the only material having all of the necessary qualifications for field artillery wheels.
WOOD Wheels are the logical wheels for trucks.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
105 West Monroe Street Chicago, Ill.

WOOD WHEELS for MOTOR VEHICLES

CANNONS ... AND ARTILLERY WHEELS.

In mid-1918 the newly formed Automotive Wood Wheel Manufacturers Association launched an extensive advertising campaign aimed at strengthening the presence of their artillery wheels over their competitors. The advertisement above lists the advantages of wooden wheels over the rest, especially for transporting heavy cargo and equipping trucks.

70. Full page advertisement published in *Motor Record* magazine, October 1919.

71. Cover of the weekly magazine *Leslie's*, November 11, 1915.

Leslie's
Illustrated Weekly Newspaper
Nov 11th 1915 Established in 1855 Price 10 Cents

THE GREAT WAR IN PHOTOGRAPHS

IN A FRENCH AVIATION CAMP
BY JAMES H. HARR

JOHN D. ROCKEFELLER
AN OLD BOY BEARS HIM

LAUGHING AROUND THE WORLD
BY HOWARD CRAY

WOOD WHEELS
for MOTOR VEHICLES

Look at the cars at any social affair

Wood Wheels do more than add to the appearance of an already good-looking car.

Experience proves that they will carry any load a motor car propel over any road upon which a vehicle can travel.

Light in weight, shock-absorbing, dependable—from every viewpoint Wood Wheels merit their preferred position on cars of the highest quality.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
32 NORTH 164 STREET PHILADELPHIA

NOTE THE WOOD WHEELS EVERYWHERE

WOOD WHEELS
for MOTOR VEHICLES

Absolutely free from flaws or defects

When a factory wheel leaves the factory it is a perfect wheel.

It has no flaws or weak spots.

This perfection of product is due partly at least, to the fact that any defect in a hub or factory is at once apparent.

The real source of imperfection in every wheel leaves these from the side and every defective piece of hub is at once discarded.

Manufacturers and users of passenger automobiles can tell themselves that when they are equipped with strong, tough, machine hubbed wheels. For this reason, the wheels to which they are subjected during their life-time must be those of the highest quality.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
32 NORTH 164 STREET PHILADELPHIA

NOTE THE WOOD WHEELS EVERYWHERE

WOOD WHEELS
for MOTOR VEHICLES

Look in any Garage

Whether the cars you see there are trucks, passenger cars, limousines or jitneys, if this you may be sure—most of them are equipped with WOOD wheels.

This is a certainty because of all the motor vehicles produced in this country during the past three years more than 95 per cent have WOOD wheels as standard equipment.

Such a preponderance of one material can have but one meaning—WOOD is the only material possessing all the qualities necessary to good wheels.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
32 NORTH 164 STREET PHILADELPHIA

NOTE THE WOOD WHEELS EVERYWHERE

What protects the wheel bearings

There is no spring suspension between them and the road. To appreciate the amount of pounding they would receive if not protected, observe a moving car—the body has little up and down motion in comparison with the wheels. The wheels jump up and down like a trip-hammer.

Rubber tires eliminate lesser vibration caused by uneven paving. But what protects the bearings from the severe shocks of ruts and bumps?

Such blows would soon pound wheel bearings out of shape.

WOOD Wheels protect the bearings.

WOOD Wheels absorb the shocks before they reach the wheel bearings. That is another reason why WOOD Wheels have been used for years and will continue to be used on the world's best cars.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
32 West Monroe Street Chicago, Ill.

WOOD WHEELS
for MOTOR VEHICLES

TIMBER! TIMBER! Over a dozen different advertisements alternated in the campaign initiated in 1918 by the Automotive Wood Wheel Manufacturers Association promoting artillery wheels, especially in magazines from the motor sector such as *Automobile Trade Journal*, *Motor*, *Automotive Industries* & *The Automobile* and *Motor Record*.

72-75. Advertisements published in *Automotive Industries* & *The Automobile*, January 1919 and *Motor Age*, September 5, 1918; and January 16 and December 25, 1919.

NOTE THE WOOD WHEELS EVERYWHERE



Announcing a new era in WOOD WHEEL Service

Official Wood Wheel Service Stations have been established throughout the country so that better servicing and greater convenience may be provided for all users of Wood Wheels.

Every station that displays the Official Wood Wheel Service Station sign has been appointed because we believe that, in its territory, it is the best equipped to render efficient servicing under the most rigid requirements as to facilities and workmanship. Furthermore, through affiliation with the Automotive Wood Wheel Manufacturers' Association, each one of these stations has access to the best

sources of wheel materials and the best engineering counsel on repair methods. As the need arises, more organizations that qualify under the Wood Wheel standard of requirements, will be appointed.

This new system of servicing means that henceforth Wood Wheel Service will be characterized by the same thorough workmanship that for years has been the outstanding feature of Wood Wheel construction.

In the May issue of this publication will be given a complete list of Official Wood Wheel Service Stations.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
 105 West Monroe Street Chicago, Illinois

WOOD WHEELS

For MOTOR VEHICLES

Wood is the only substance that possesses ALL qualities essential to a perfect wheel material

Members of this Association guarantee Wood Wheels of their manufacture for the life of the car or truck on which placed.

Automotive
Wood Wheel
Manufacturers'
Association

NOTE THE WOOD WHEELS EVERYWHERE



Hub Standardization is coming

In the automotive field, the advantages of standardization have been proved conclusively in every case where consistency has been adopted. Thread dimensions, tire sizes, brake lining sizes, oil cup dimensions, piston ring sizes and spark plug construction all have been standardized. And in each instance the application of the principle has eliminated confusion, produced better products, simplified servicing and reduced manufacturing costs.

Unfortunately, however, standardization has not been applied to wheel hubs. Today there are over one hundred types of hubs

In service in spite of the fact that approximately 80% could be eliminated and will have all parts of such standard.

High standardization is coming. It means universal convenience in the manufacture of axles, bearings, hubs and wheels. It means interchangeability, better parts and simplified servicing.

The Automotive Wood Wheel Manufacturers' Association is a democratic champion of hub standardization. It is prepared to furnish data on the subject to those who are interested. Address communications to the office of the Association.

AUTOMOTIVE WOOD WHEEL MANUFACTURERS' ASSOCIATION
105 West Monroe Street
Chicago, Illinois

WOOD WHEELS

For MOTOR VEHICLES

Wood Wheels are unique in strength, resiliency and durability

Members of this Association guarantee Wood Wheels of their manufacture for the life of the car or truck on which placed.

Automotive
Wood Wheel
Manufacturers'
Association

OFFICIAL SERVICE SHOPS.

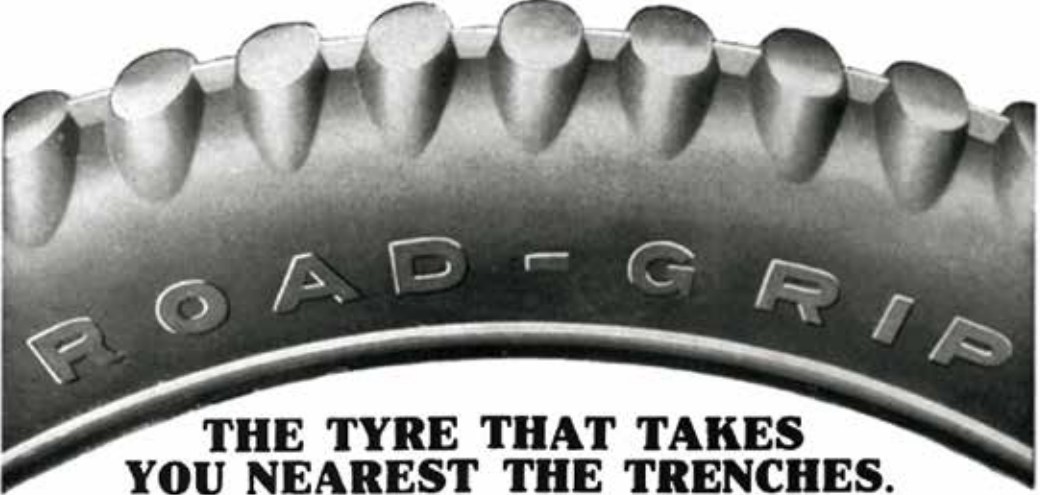
To preserve the consumer market for wooden wheels and pressured by advances in other technologies employing metal, the Automotive Wood Wheel Manufacturers Association deployed a nationwide network of specialized service shops to provide appropriate services. Another challenge of theirs was the goal of standardization, especially "among the nearly two hundred types of sockets and axles that exist in the market, 80% of which can be eliminated."

76. Advertisement published in the monthly *Automobile Trade Journal*, April, 1921.

77. Advertisement in the journal *Automotive Industries & The Automobile*, February 17, 1921.

STEPNEY

MILES AND GRIP.



ROAD-GRIP

**THE TYRE THAT TAKES
YOU NEAREST THE TRENCHES.**

THE STEPNEY SPARE MOTOR WHEEL, LTD.
Stepney Works,
LLANELLY. AND OF ALL GARAGES. 168, Great Portland Street,
LONDON, W.



STEPNEY

TWO
BRITISH GRIPPERS

STEPNEY ROAD GRIP

TYRES

THE BULLDOG GRIP.

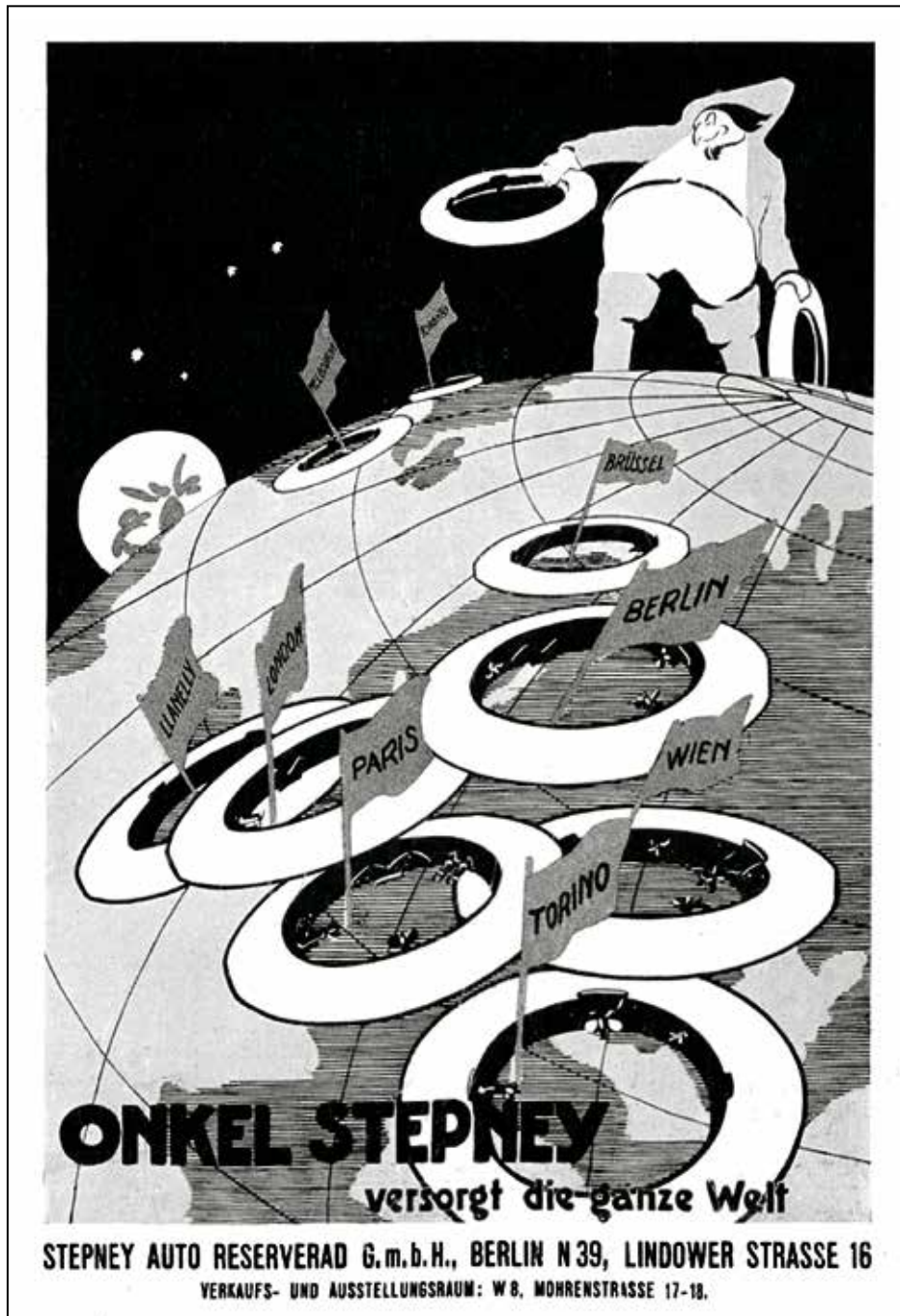
The corporate and promotional mascot for the British spare wheel company The Stepney Spare Motor Wheel was the figure of an English bulldog, a small guard dog symbolizing and exemplifying the grip of their rubber treads to the road.

78. Advertisement module published in the British magazine *The Light Car and Cyclecar*, December 20, 1915.

79. Enamel sign, 60x90 cm, c. 1915.

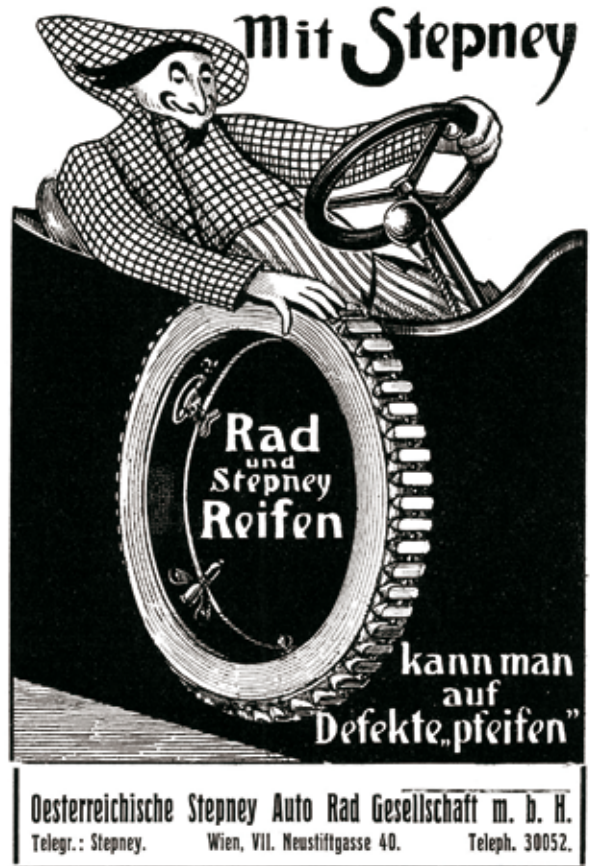
80. Detail of a 1926 British advertisement for the Stepney Balloon tyre.





THE EUROPEAN MARKET. The image above is an advertisement depicting the expansion of the Stepney company and their spare wheels throughout Europe and the American continent, as well as the establishment of headquarters in some of the most important capitals and cities: London, Paris, Turin, Vienna, Berlin, Brussels, Melbourne and Toronto, not to mention the city of Llanelli in South Wales, the founding center.

81-82. Advertisements published in the Austrian-German magazine *Sport im Bild*, in 1913 and 1911.



THE GERMAN MARKET. For the advertising of their wheels in Germany, Stepney did not employ the emblematic English bulldog but rather utilized a character from the fables as company ambassador: Onkel Stepney [Uncle Stepney]. He was a giant wearing winged boots that, emulating the boots of seven leagues, were able to travel enormous distances without any effort, a quality that was linked to their product.

83-85. Advertisements published in *Sport im Bild*, 1911. 86. Advertisement in *Automobil-Zeitung* magazine, April, 1913.



THE CORPORATE MASCOT ZOO.

In this humorous scene, published in an Austrian automotive magazine under the title *Die Menagerie des Automobilisten* [The menagerie of motorists' beasts], Uncle Stepney and Bibendum, the mascots for two competing tire brands visit a very unique zoo. Enclosed in each cage is an animal that is, in addition, a symbol—in many cases also used as a mascot—of their respective company, all being related to the automobile and bicycle sector. Among those beasts we can recognize the eagle of Fichtel & Sachs—manufacturer of bicycle bearings and parts—, supported on a ball bearing and the one of the car manufacturer Adler, from Frankfurt, holding a wheel. Next to the birds, we see three fantasy beings: the two-headed eagle