SUGGESTED CITATION:
MEDRANO-BIGAS, Pau.
The Forgotten Years of Bibendum. Michelin's American Period in Milltown: Design, Illustration and Advertising by Pioneer Tire Companies (1900-1930).
Doctoral dissertation. University of Barcelona, 2015 [English translation, 2018].

THE CRAZY (and difficult) ROARING TWENTIES

After the exceptional period that World War I constituted, a new and fierce commercial scene was inaugurated on both sides of the Atlantic. In the United States, both the return to normality and an initial response of markets that were euphoric presaged a progressive and upward recovery of the economy. However, the wide sweeping and severe recession of 1920-1921, although economic, lowered expectations and sowed uncertainty, fundamentally affecting the pneumatic tire industry and beginning a decade of strong competition and progressive concentration of business. The Michelin Tire Company in Milltown, which invested heavily in securing their products for the domestic market, was besieged by the dominance of large, firmly positioned firms and the emergence of new rival companies.

1. A new horizon

The war period marked the rhythm of production for the automobile and tire industry in the United States and in Europe, with restrictions on the consumption of raw materials, such as steel and rubber and the circumstantial reconversion carried out to respond to the demands of respective armies. After the end of the war, the large companies that had secured government contracts were strengthened, while the rest—the numerous medium and small firms—having unequal advantage and fortune found themselves struggling at the beginning of the 1920s.

An example of what occurred can be seen in the French automobile companies Renault, Berliet and Peugeot. All of them participated to a large extent in the motorized war industry and armament deployed between 1914 and 1918, thus benefiting from a situation that was, in principle, uncertain. In the case of Peugeot, their profits annually increased sixfold compared to 1913 and their factory in Billancourt was amplified and tripled its initial size.[1] This productive fever increased and allowed for the transformation of the weapons factory owned by André Citroën into one of the largest French automobile companies of the next decade. Another example was the policy of monopolizing virtually all production of vans and trucks for military use by firms such as Saurer, De Dion-Bouton, Panhard, Bayard-Clement, Delahaye, Lorraine-Dietrich and Aries.[2] If we analyze the impact of the war effort on foreign motor indus-

tries we can observe a similar situation. For example the Italian Fiat was contracted to provide the Italian Government and Allied forces with supplies from their factory in Turin.[3]

In the particular case of the Michelin Tire Company, this whole process was subject to the policy of the parent company in Clermont-Ferrand, affected and limited in turn by the difficulties experienced at the beginning of the war in Europe. As the conflict advanced, so did the firm's contribution as a supplier for the French army, consolidating their position in relation to their competitor Bergougnan in Clermont-Ferrand, who had previously held a more favorable market share. The diversification undertaken because of the war effort—manufacturing pneumatic tires, gas masks, waterproof sleeping bags and tents, shells and ammunition, fighter jets, etc.—allowed Michelin to maintain personnel and the supply of raw materials also used for production that was intended for the European civilian market. Despite the opacity of information on the subject, Michelin undoubtedly benefited greatly from their contracts with the government:[4]

> "The war corresponded to a period of strengthening the value of social capital. At the end of the war, with various reserves and supplies at their disposal, and thanks to the profits from their foreign affiliates, Édouard Michelin had a 'war treasure' at his disposal which gave him considerable room for maneuvering. Unquestionably, the three rubber companies from Clermont-Ferrand [Michelin, Bergougnan and Thorrillon] accumulated during the war, and especially in the years 1916-1917, greater profits than those reflected in their accounting records. The Clermont-Ferrand companies in the sector, even before the war, had already produced high profits (…) that the conflict allowed them to maintain. After more than a year of uncertainties, they quickly recovered the usual pre-conflict margins." [5]

In America, however, the Michelin Tire Company in Milltown saw their leading role diminish to only having specific contracts such as the manufacture of gas masks with rubber parts and waterproof fabrics. However, they never participated in the U.S. war effort in any significant way.

2. Time to invest

In the period from the end of 1914 to the early 1920s, the U.S. subsidiary had to address making significant investments in different aspects of the business. In addition, they were subjected to fluctuations in the cost of raw materials such as rubber and steel, especially during the period affected by the outbreak of the war in Europe and the subsequent development of the conflict. Precisely after the signing of the armistice, an attempt was made to revive the economic vitality of the Michelin Tire Co. in Milltown, probably due to an important financial contribution injected from the parent company that endowed their U.S. subsidiary with sufficient financial support to deal with new challenges.[6] The main investments were as follows:

2.1. Improvement of facilities.

The Milltown plant had to adapt to production expectations, since the facilities and machinery utilized until then were insufficient to allow for the development of the new Universal Tread tires. Thus, between the end of 1915 and the start of 1917, several facilities were added and a major installation was constructed that consisted of three production warehouses. Together with the amplification of the electrical plant, this practically doubled the factory's productive capacity. The Milltown factory continued with the improvement and expansion of their facilities, with the addition of new

warehouses and other units specifically designed to improve the performance of the power plant —with the installation of a new turbine—between 1920 and 1921.[7]

2.2. Technological renovation.

To cope with the Universal Tread production they had to overcome the difficulty of having the machinery available in time to produce the entire range of pneumatic tires in their catalog—with different tread widths and diameters, such as the popular 30 x 3 ½ for the utilitarian Ford—, and thus assumed the manufacture of their own matrixes and molds.[8] The emergence of cord technology and subsequently, in 1923, the development of the low pressure Comfort Cord tire meant a continuous outpouring of expensive investments in the renovation of machinery and molds necessary for its production.

2.3. Expansion of staffing and review of working conditions.

The Michelin Tire Company had to fight against labor shortages during the Great War. First, at the beginning of the conflict in Europe when a large part of their French workers marched off to defend their native homeland. And then at a later time, when the United States entered the war as an Allied force resulting in the enlistment of local American employees. In spite of that, between 1915 and 1920 the Milltown factory's personnel doubled, reaching a figure of nearly 3,000 employees. In order to achieve a certain degree of stability and accommodate new hires required for Universal Tread production, the company had to offer more advantageous working conditions with respect to their competitors to attract, retain and generate loyalty from their workers. In this context, the continuous rise in wages during 1917 and especially the actions taken in 1919—after the end of the war—included the construction of houses next to the factory to accommodate workers and their families and the creation of free life insurance coverage that was proportional to the years of seniority with the company.

2.4. Social actions.

The Michelin Tire Company cultivated employee loyalty with their social policy and constructed a network of complicity with the Milltown community. Among these actions we can highlight: the multisport field, refurbished in 1914 at a cost of $ 6,000;[9] the French Clubhouse created in 1917 and located in installations ceded by Michelin; the Michelin Community House which served as a leisure area with a theater, cafeteria and covered sports court; and the donation of $ 15,000 for the construction of the Church of Our Lady of Lourdes in 1921. In addition, during the Great War, important contributions were made to the war effort through successive Liberty Loans which were the issuance of national war bonds. In the fourth issuance, for example—apart from the estimated $ 60,000 individual and personal contribution from workers—, the company's management disbursed $ 100,000.

2.5. Commercial spending.

Michelin continued to invest in the expansion of their commercial network, establishing important territorial branches. Since 1917 there were eighteen fixed affiliates, and nine more were added between 1919 and 1920. In that last year the Michelin Tire Company in Texas was also established, with headquarters in the city of San Antonio. The strategic delegation in San Francisco was relocated to a new building with modern facilities that would be destroyed a year later in a catastrophic fire, with estimated damages ranging from $ 30,000 to $ 50,000.

2.6. Advertising expenditures.

With regards to advertising investment—explained in detail in Chapter 19: "Media, promotional supports and advertising expenditures"—, it's worth noting the scarcity of insertions in the U.S. press during 1913-1915, most likely limited and affected by the difficulties the French parent company experienced at the dawn and onset of the war in Europe. It was at the end of 1915 when the first and rather nondescript advertisement for Universal Tread tire appeared in American newspapers. In January of the following year a campaign was launched to promote the new pneumatic tires by investing in written press—newspapers and magazines of different scope and diffusion—, unprecedented for the company and which lasted until the end of 1919. A January 1917 press release issued by Michelin gave vague clues about the investments: "The amounts of money spent on advertising cannot be specified throughout the year that has ended, but it is obvious that the total sum is several hundreds of thousands of dollars." In 1920 the investment in publicity was resumed, in this case presenting the novel Michelin Cords, that replaced the previous obsolete model.

2.7. Diversification and new products.

In January 1920, Budd-Michelin steel disc wheels and other products designed for the maintenance and repair in the event of punctures were added to pneumatic tire covers and inner tubes for cars and trucks. Although repair kits with patches and cement glue already existed, the new rubber cement Mastic was launched in 1921.[10] Other products such as tools, valves, etc. were brought to market in order to facilitate mechanical manipulation when changing the wheel.

3. Pneumatic tires, a highly competitive market

At the beginning of the twenties, what was Michelin's true clout and position with respect to other competitors in the American market? Michelin had obtained a solid base from which to operate in the United States with the purchase in 1907 of the International A & V Tire Company and their operational facilities in Milltown. The industry was led by the United States Rubber Company which, in 1905, had acquired control of the business conglomerate united under the Rubber Goods Manufacturing Company and, as part of the package, key pneumatic companies such as Morgan & Wright, Hartford Rubber Works and G & J. The remainder of the list of the most important firms was formed by the already established Goodrich—a diversified company, whose automobile pneumatic tire division in 1907 constituted 33 % of their business[11]—; Diamond—acquired by Goodrich in 1912—and the fast-growing Goodyear, Firestone—who had started out in the automobile pneumatic tire business in 1903—and Fisk Rubber.

The rise of the American automobile industry[12] also led to the exponential growth of the pneumatic tire: between 1904 and 1909, in addition to Michelin, more than 20 new companies competed in the sector; between 1909 and 1914 about thirty more, and only in the period from 1915 to 1916, 23 new companies were incorporated.[13] What in the beginning the Michelin brothers thought would be promising territory to exploit and only having a finite list of commercial rivals became, in a short period of time, a very crowded and highly competitive sector, endowed with great business vitality. Michelin, despite their proven experience in Europe, their prestige and technological background, was relegated to the background early on, surpassed in their ambitions to expand due to the unusual momentum of local companies (see **TABLE 1**).[14]

At the beginning of the 1920s, the ranking of leading companies in the tire industry placed Michelin below the first sixteen positions, and quite far from the five that prominently led the list. They found

themselves competing in a sector occupied by a group of eight firms with comparable productive capacities (see **TABLE 2**). One fact also illustrates the distinction between the leaders and other medium-sized companies such as Michelin: out of a total of 55,496 workers employed by the entire U.S. pneumatic tire industry in 178 factories during 1921, Goodyear had 8,537 workers, Firestone nearly 4,000 workers … and Michelin hired approximately 2,000 workers.[15]

I have not found specific information as to how the crisis of 1920 and 1921 could have affected the Michelin Tire Company and production at their Milltown facility. There is no news in the press, apart from certain labor conflicts and a strike at the end of the third quarter of 1919 whose reasons are unknown, but may be related to and precede the progressive worsening of employment that led to the general recession of 1920-1921.[16]

In the absence of new sources, the direct testimony of a French employee from the Michelin Tire Co., manifest in a handwritten and personal letter addressed to a relative dated November 1920, provides interesting information about the direct impact of the economic panorama on the development of the Milltown industrial complex:

> "It's just as I tell you, the situation in America [in the Michelin factory] is very bad. Except for French workers, people are being fired on a daily basis. No one works more than four days. I work outdoors, outside the factory, so I always have tasks to do. I would have been offered to work in the factory for some time now, had the situation not been so bad. Outside of the factory I can have more work than others. I'm not sending you money right now because the situation is very bad and the Michelin plant will probably be closed for a while (…) If they close the factory I will work as a lumberjack until the factory reopens."[17]

4. Obsolete technology

The UT-Universal Tread tires, launched in the American market at the end of 1915 and in the French one two years later—under the name RU-Roulement Universel or Pneu Moderne—were the culmination of the process begun in 1912 by Michelin to adopt the solution of pneumatic tires with non-skid studs made entirely of rubber. The Michelin UT model was the type of cover generically known as fabric, the prevalent standard for most manufacturers in the early 1900's and until the dawn of World War I. Fabric covers were constructed with different superimposed layers of nappa strips—fabric interwoven at right angles to form a dense and uniform textile or canvas—which were impregnated in rubber and subsequently hardened by vulcanization. The construction of Michelin UT covers employed between five and eight nappa layers, depending on the size of the wheel, compared to what was considered sufficient—from four to seven layers—for other brands' covers.[18]

At the time the new Michelin model was presented, the technological gap with respect to their leading rivals was already about five years. While the company reconsidered their opposition to non-skid rubber treads, the rest of the industry had already taken a new step forward, investing in pneumatic tires having what was generically known as 'cord technology.' The year 1915 not only marked the debut of the Michelin Tire Company in Milltown's Universal Tread, it also marked the year of the massive introduction of cord technology in their American competitors' tire models. In addition, the new UT tires, after the huge investment and the effort to develop them, did not yield the expected result. According to several authors:

> "(…) the 'Pneu Moderne,' sculpted in the same way as American pneumatic tires … is a failure: it dangerously overheats."[19]
> "(…) Its resemblance to American products is basically exterior. From a technical point of view the Michelin tire is not up to par: it can get hot. The textile layers utilized do not seem to measure up. Unless it is due to the mixture [of the rubber] employed in the tread, which offers a high level of resistance [upon the wheel's normal rotation on the road surface] when the auto is running."[20]

5. Silvertown Tires

The new cord technology was intended to solve the problems detected with fabric covers, inherent due to their textile base—and the layout of the layers—employed in their construction. While driving, with the vehicle in motion, the wheels spin at a high speed and with each rotation, an area of the pneumatic tire compresses upon contact with the road surface due to the weight born, thus affecting internal air pressure. It returns again to its original form when the tire detaches itself from the road, and so creates a cyclical process causing layers to rub against each other and producing mechanical action similar to that obtained by the blades of scissors. This friction generated high levels of air and materials being internally heated thus favoring the consequent degradation of the tire. This was also true for bicycles but especially so for motor vehicles, where the effect was multiplied due to the speed reached and the weight supported by the wheels.

The first to find a technical answer to this issue applied to bicycle wheels was presumably the Englishman Thomas Beavan Sloper. He experimented with the use of rubber-impregnated fine cord instead of interwoven threads and patented the idea in 1889, without finding the necessary support to apply it commercially.[21]

A similar solution—placing these cords in parallel forming layers of cross-arrangements and at different angles—was found by the American inventor John Fullerton Palmer, with an American patent issued in early 1893 and applied for the first time to racing bicycle wheels.[22] Palmer founded two companies especially dedicated to commercializing the licenses and tires based on his invention, but as he did not own a factory the production was arranged with recognized industrialists from the sector.

Palmer founded the Palmer Pneumatic Tire Company, while the company in charge of manufacturing—and commercialization—was BF Goodrich which, besides their own bicycle pneumatic tires, also manufactured other brands under license.[23] Such was the case for agreements with Morgan & Wright and G & J. In 1898, BF Goodrich acquired patents and exclusive rights to manufacture these types of covers for the United States.[24]

In 1893 Palmer also created Palmer Tire Co. Ltd. in England and licensed the manufacturing and commercialization rights of his invention to the powerful India Rubber, Guta Percha and Telegraph Works Co. Ltd. from Silvertown, London.[25] In 1902 , two years before the contract expired, the Silvertown company acquired the Palmer company and made it one of their subsidiaries.[26] Christian H. Gray, the company's technical director, partnered with Thomas Sloper to develop—with English patents in 1903 and American patents granted two years later[27]—and finally to produce in 1904 the first cord pneumatic tire for automobiles with the name Silvertown Cord.[28] John F. Palmer remained connected to the industrial sector, first as an advisory engineer for the Hewitt Rubber Co. in Buffalo, New York (fig. **57**) and later, in 1927, as an executive and engineer of the Seiberling Rubber Company.

Briefly, the casing of the cover for this tire consisted of several pieces that acquired consistency via the processes of vulcanization and firing. First, a layer of rubber constituting the interior or base of the casing; over this, a layer of parallel, rubber- impregnated cords extended diagonally and wound in a helix along the casing, on which another rubber layer was placed; over the latter layer, a second layer of parallel rubber- impregnated rubber cords extended diagonally in the same way but from an opposite and crossed direction to that used in the first; two layers of reinforcing rubber covered everything, and another added to strengthen the tread and finally the sidewalls of the tire casing (fig. **6**).

In 1910, the Diamond Rubber Co. from Akron, Ohio obtained the rights to manufacture it in the United States, paying the sum of $ 750,000, and in 1911 launched the Diamond Silvertown Cord tire.[29] In 1912 BF Goodrich absorbed Diamond and incorporated tires with this type of technology into their catalog. The Silvertown Cord appeared in 1915 (figs. **1-8**), and until the 1970s BF Goodrich's high-end pneumatic tires were branded with this commercial name.[30]

6. The new Michelin Cord

The technological change from fabric pneumatic tires to cord technology took place gradually but progressively, with both coexisting in the U.S. market for a long period of time: 1923 was the first time the production of cord pneumatic tires (55.4 %) exceeded that of fabric pneumatic tires (42.6 %). The latter ceased to be produced in 1929, when attention was already focused on the technological dispute between the cord and the then-dominant low-pressure balloon pneumatic tire (see **TABLE 4**). Most of the companies—including Michelin—offered the two types in their catalog. This was due to the fact that, although the differences in quality were important, so were the prices; Michelin fabric tires, in equal dimensions, were between 30-40 % cheaper than corresponding cord tires. Although the latter offered a higher return in the medium and long-term due to a longer lifespan, the initial investment of the buyer constituted a major expense. It must be taken into account that fully equipping a vehicle involved four wheels plus the addition of spare ones.

The new Michelin Universal Cord was introduced to the American market in March of 1919, although its commercialization did not take place until the end of year.[31] The definitive commitment to this product began in January 1920 with a large advertising campaign focusing on press advertisements that was maintained until the emergence of the modern balloon pneumatic tire in 1923 (figs. **11-15**). The exterior appearance of the Michelin cord covers was characteristic: the tread was formed by the modular repetition of pieces similar to a capital letter N—instead of the typical M in the Universal Tread—by short and vertically traversed rods that had a central ridge unifying them.

In fact, the patent for that design—U.S. Patent Number 51,555, signed by Jules Hauvette-Michelin—had been requested on October 2, 1917 and finally accepted on December 11, indicating that perhaps it was not initially conceived to apply to cord covers (fig. **10**). As to its internal construction, the cover was formed by double layers of cords, each of which was placed at right angles to the next, unlike ordinary cord covers, which used individual layers. For this reason the model was known in the beginning as Michelin Double Cord, soon to be renamed as the Michelin Universal Cord.

The Michelin Universal Cord developed at Milltown was presented in France on December 1, 1919 under the name Câblé (figs. **18-19**)—baptized "Cablè" in Italy and "Cablé" in Great Britain (figs. **16-17**)—, and became the company's flagship product.[32] Michelin also applied this technology in Europe to pneumatic bicycle tires in 1921, and to motorcycles in 1922.[33] However, it seems that this new model was

also not in a position to compete in the market with products that were theoretically similar to those offered by rival companies; as affirmed by a statement from Jemain (1982):

> "The 'Câblé' (1920), launched quickly to make us forget the defects of the 'Moderne,' is not much better."[34]

Michelin remained obstinate in maintaining their once popular non-skid "Semelle," and in 1921 created a tire model with cord casing and steel-studded treads, also made for the American market in their Milltown factory. The model was sold at a price that was 10 % more expensive than its counterparts with entirely rubber treads. In those years, this type of solution—previously adopted by most of the firms in the sector—was in decline, if not in disuse. According to an article from the time specifically addressing non-skid steel-studded tires in the French market, Michelin produced in 1921 60 % less Semelles than the years preceding the beginning of the Great War. Pirelli reported 40% lower sales in their models than the previous two years, and the French factory of BF Goodrich ceased that same year the production of their non-skid steel-studded tires, which represented 25 % of their total sales.[35]

7. The next link: low pressure pneumatic tires

The advantages offered by cord technology allowed pneumatic tire design to take a new and important step forward. It reduced the problem of friction between nappa layers and internal heating, extended the use of reinforcing agents and compounds in improved vulcanization processes—such as adding carbon black to mixtures—and significantly increased the useful life of the tire. As such, efforts of various manufacturers focused on improving performance while driving.

The size of pneumatic tires—obviously, the larger the size, the greater the air cushion—in a correct proportion to each type of vehicle allowing for adequate air pressure so as to offer maximum comfort for the driver and passengers was the new battlefield. The idea of offering larger, supersized or oversized pneumatic tires for the same rim size was not new. The German company Continental offered this type of tire in Europe, while in the United States Goodyear announced in 1910 and 1911 their No-Rim-Cut tires based on straight side rim technology which allowed inner tube capacity to be increased by up to 10 % more than that provided by standard size clincher-type rims (figs. **24-25**).

Also, in the spring of 1917, BF Goodrich offered their new Three-Seventy-Five model employing fabric technology. They were pneumatic tires with a cross-section measuring 3.75 inches (31 x 3 ¾)—a "heroic measure" as they called it in advertising texts—and with a circumference one inch larger than the standard 30 x 3 ½ employed by the utilitarian Ford for their rims (figs. **26-27**).

At the end of 1917 the novel oversized Jumbo pneumatic tire of General Tire & Rubber Co. in Akron, Ohio—a company created two years earlier—, was brought to market.[36] It was a cover—with its corresponding inner tube—having a larger cross-section than the usual, in order to obtain extra air cushioning that would offer greater comfort than standard size pneumatic tires (figs. **28-30**). This particular oversized model was made of fabric technology, constructed with nappa and therefore, did not incorporate the qualities provided by cord technology, the latter also being offered in the company's catalog. In addition, it followed the inflation standards for high and medium pressure which were applied to ordinary pneumatic tires. In spite of its expanded size, it was designed to fit smoothly into the standard 30 x $3^{1}/_{2}$ inch rim of most light cars and in particular for brands such as Ford, Maxwell and Chevrolet.[37] As such, it became a best seller which allowed the company to cope with the crisis of 1920-1921.[38]

One of the usual behaviors among motorists was to inflate pneumatic tires with pressures below those recommended by the manufacturer. Even though this affected their integrity, a greater shock-absorbing effect was achieved that softened vibrations and shaking. The usual pneumatic tires, due to high inflation pressure, were more 'rigid' and had a smaller capacity of absorption. This principle, which was already utilized extensively on airplane wheels, became a commonplace option for the automobile world when applying it—along with resizing—to cord pneumatic tires.[39]

The Firestone Tire & Rubber Company was very committed to the new technology. In 1920 they had developed their own method for the individualized impregnation of cords in the construction of cord pneumatic truck tires. This was employed in the creation of their first low-pressure wheels—resized and discarding the fabric technology—, in October 1922. After numerous tests, the evidence obtained exceeded expectations and production began on April 5, 1923. Practically one year later, in March 1924, Firestone manufactured 25,000 of these new tires a week, and reached an important agreement to factory equip Ford automobiles.[40]

In 1923 a debate began to name and agree on the term that defined these new tires. Words like 'donut', 'supersize,' 'super-pneumatic,' 'air-cushion' and 'low pressure'—as opposed to the standardized high and medium inflation pressures of fabric and cord pneumatic tires, consequently considered as high pressure—were intermixed in the specialized literature of the time. On November 26 of that year the Tire Executive Committee of the Rubber Association of America formally adopted the name of 'balloon,' reclaiming precisely the term that primitive pneumatic tires had received in their first appearance when challenging solid rubber tires which were, until that moment, the prevailing model.[41]

In reality, the balloon model embodied the original spirit with which the first pneumatic tire was designed—the Aerial Wheel patented in 1845 by the Britain Robert William Thompson—and its final integration into the equipment of automobiles: a chamber of air between the ground and the vehicle to achieve a more comfortable drive than that provided by solid rubber tires. The balloon pneumatic tires —as compared to the ordinary cords—could hold twice as much air, thanks to the increase in their size and space, although they inflated to only half the typical pressure. Larger sizes and lower pressures based their effectiveness on a more elastic casing on their sidewalls, consisting of four layers of cords instead of the six that were commonly established for standard cord tires. In this way, by increasing the volume of air, with less pressure than usual and expanding the contact zone between the tread and the ground, the strain born by the tire was smaller and more evenly distributed. The traction capacity of covers increased, as well as the grip and non-skid functions of treads.

Finally, the transmission of vibrations to the vehicle and its occupants, as well as the tendency for punctures was minimized by the shock-absorbing capacity of air at low pressure. As an article in the American rubber sector magazine *The India Rubber World* explained, making a veiled reference to the famous slogan "le pneu boit l'obstacle" ("the tire drinks up obstacles") coined by André Michelin in 1893:

> "The tendency to puncture [of balloon pneumatic tires], it is claimed, is reduced because the small weight supported by each square inch of tire makes it possible to ride safely over sharp objects that would injure ordinary tires. Being soft, because of the low air pressure, the tire does not 'fight the road,' but simply folds itself over, absorbs or 'drinks' ordinary obstructions."[42]

This sensation of comfort and driving on a shock-absorbing cushion of extra air was exploited in publicity, multiplying—in the advertisements for different companies—the use of "aerial" visual metaphors in the form of hot air balloons, clouds and skies or birds (figs. **48-70**).

8. The ascent of the balloon

The sum of the virtues of the new balloon technology produced an unexpected advantage—it substantially increased the duration of the tire. In addition, it was argued that they also decreased the transmission of jolts and vibrations to the chassis and to mechanical elements, which prolonged the life of the vehicle by approximately 50 %.

In September-October 1923, after initial resistance to change—and some manufacturers still maintained this position in the following months—there were already twenty-one companies that had started to produce balloon pneumatic tires in one or more of the eight standard measures adopted by the Rubber Association of America (see **TABLE 3**). Almost all of the leading firms in the business were represented on this list, and they supplied various automobile manufacturers with samples of their products to undergo different tests, anticipating possible demand (figs. **31-32**).

In **TABLE 3** we can see that Goodyear and Miller incorporated seven of the measurements into their catalog, followed by Firestone, Fisk, General and BF Goodrich with five; Hewitt with four; Armstrong, Brunwick and Pennsylvania with three; Horseshoe, Michelin and United States with two; Ajax, Corduroy, Empire, India, Mohawk, Racine and Vitalic with one. As can be seen, three of the dominant "Big Four" Goodyear, Firestone and BF Goodrich—although the latter had certain reservations—joined in on the technological advance. In contrast, it is worth noting that the industry leader, United States Rubber, had a lukewarm response to this innovation. Although Michelin is in the lower part of the table, it should be highlighted that special balloon measures uniquely offered by Michelin are not included here, as the Rubber Association of America did not include them among their standard measures (see **TABLE 3** in annex).

The most represented size among manufacturers was the one that was most in demand, measuring 29 x 4 ½, usually employed by taxis and passenger cars. According to a December 1923 article, Firestone, Goodyear, Miller, and Michelin were the most active, and establishments within their commercial networks began to receive and store the new, ready-to-sell pneumatic tires.[43]

One of the obstacles the industry had to solve for the implementation of the balloon pneumatic tire was to standardize the measures of wheels and rims that were able to house the new model. In this context Colin Macbeth, development and experimental engineer for the Dunlop Rubber Co., Ltd with the Fort Dunlop factory in Birmingham, England, visited the United States. His first mission was to meet with the managers of Dunlop's American subsidiary, Dunlop Tire & Rubber Corporation established in Buffalo, New York, to study the feasibility of manufacturing Dunlop low pressure tires in America. Secondly, he sought to draw the attention of the major American manufacturers to the urgent need for unifying criteria and measures.

It should be noted that the Dunlop company claimed recognition in the development of balloon pneumatic tire technology, stating that their first and satisfactory experiments were carried out in 1916 and that, following the disruption caused by the Great War, they successfully implemented the standardization of measurements. According to Macbeth, in England there were at that time thirty-eight typical

measures compared to the five special measures for low pressure tires.[44] In any case, Dunlop low pressure pneumatic tires were formally presented at the International Motor Exhibition held at the Olympia venue in London on November 2-11, 1923.[45]

Another notable incident was the lawsuit filed by Steel Wheel Corp. from Detroit, Michigan against BF Goodrich, the first of a long list of companies that were expected to be sued for infringing patent rights in the manufacture of balloon pneumatic tires. Patent number 1,537,879 had been filed by Alden L. Putnam in August 1920, finally granted May 12, 1925 and licensed to the Michigan corporation, who initiated the lawsuit in 1927. Although the suit was against BF Goodrich, the scope of the verdict affected the rest of the industry, taking into account that until that date it was estimated that in the United States about 56,000,000 balloon tires had been manufactured. The District Court of Michigan finally decided, in June 1930, to invalidate the Putnam patent.[46]

The influence of the low pressure pneumatic tire is reflected in the evolution of the percent distribution of tire production for the market comparing the established high pressure cord, the disappearing fabric tire and the balloon tire. In 1923, the first year of the balloon tire's market launch, its production was a promising 2 %, compared to 55.4 % for cord and 42.6 % for fabric models. In its second year the figure for the balloon tire increased to 11.5 %. From then on, its growth was progressive and spectacular, and in 1927 it had already reached half of the production (53.9 %) for the sum of all three different types of technology. In 1930, ten years after its debut—and with fabric tires already withdrawn from the market—the production of balloon pneumatic tire covers was 89.2 %, compared to 10.8 % for the cord tire (see **TABLE 4**).

9. The comfort of Michelin pneumatic tires

Following the trail marked by Firestone and their first balloon produced in April 1923, Michelin announced in Paris, in mid-August, the development of their version of this technology. These were known as the Michelin Câblé Confort tires, and would be formally presented at the *XVIII Exposition International de l'Automobile* to be held October 4th-14th in the French capital. With this statement, two months prior to the event, the multinational firm shocked their European competitors and much of the U.S. industry (figs. **33-34**), revealing that the product had completed its testing phase and was ready for mass production.[47]

The Câblé Confort pneumatic tires followed the constructive principle of cords applied in the Câblé model but instead of the usual 80 or 90 mm, they were endowed with an enlarged 130 mm, and instead of the habitual pressure of 3 to 4 kg, they were only inflated to a pressure between 1 and 2 1/4 kg. The various sizes of pneumatic tires initially adopted were designed to equip light vehicles, such as the most popular and accessible models of Renault and Citroën, and other brands such as Amilcar, Salmson or Mathis.[48] In Italy Cablè-Confort was publically launched in an article for their corporate magazine *Bibendum*—in the September-October issue—offered free of charge to motorists and customers. In the final issue at years end, a new article was published in which the technical characteristics of the product were analyzed in more detail.[49]

Advancing the European market, the Michelin Tire Company in Milltown announced in early November 1923, the immediate launch in the U.S. market of their new line of balloon tires, the so-called Comfort Cord. They manufactured five basic sizes designed to fit without any need for adjusting the corre-

sponding rims—straight-side type—for American cars.[50] But the pneumatic covers from the Milltown factory were visibly different from their Michelin European counterparts. Whereas in the old continent a subtle redesign of the tread used in the previous "Câblé" model was adopted—that is to say, by repeating a module in the form of a capital letter 'N'—in the United States a new and differentially designed tread was created, protected by patent number 64,415, registered on February 6, 1924, granted on April 8 of that same year and signed by Jules Hauvette Michelin. The drawing of the new tread was called Tiger-Grip, in metaphorical reference to the grasping power of tiger claws (figs. **35-41**).[51]

At the end of 1923 the advertising campaign was initiated, with the appearance of the first advertisements in American press accompanied by public demonstrations of the novel model. For example, during the first week of December, different automobiles were dispatched to given points in Newark and New York. By obtaining a special pass—which had to be previously requested in associated establishments of Michelin's commercial network—, the public had access to test the vehicles and evaluate the qualities of the balloon pneumatic tires with which they were equipped.[52] The publicity and promotional display of the Michelin Comfort Cord was widely disseminated in January of the following year and continued in successive campaigns until the end of 1926 (figs. **43-45** and **48-50**).

According to Michelin, the differential factor of their American balloon tires compared to the rest could be summarized in the following four basic points:

> **I. Compatibility.** The tires were available in sizes compatible with the two types of existing rims —straight side and clincher—without having to make any mechanical modifications.
>
> **II. Size.** For the same sizes, Michelin's balloon pneumatic tires were proportionally larger. For example, on 32 x 4½ rims, a Michelin Comfort Cord had 117% air space compared to the usual high-pressure cord model. In addition, other balloon tires also recommended for that rim size only offered 49%.
>
> **III. Comfort.** They required less air than other similar models, about 11% less than the official inflation pressure table recommended by the American Tire and Rim Association. This allowed for a more comfortable and easy ride than that provided by other balloon tires.
>
> **IV. Duration.** The Michelin tires offered mileage—a useful lifespan indicator measured as distance traveled— that was 20% greater than the best high pressure cord models, and up to 36% higher than other similar products produced by their competitors. Early in 1925 the Milltown firm reported that they had carried out a series of tests that yielded this revealing result. A representative sample including at least 75% of the different brands of balloon tires that existed in the American market was evaluated, acquiring them directly from stores with proven reputation. Each taxi in the fleet was equipped with two balloon pneumatic tires on their rear wheels: on one side a Michelin Comfort Cord, and on the other the balloon tire from another brand. In order to guarantee the fairness of wear and tear to which they were submitted, totaling 6,600 km of travel, in half of the cars Michelin tires were placed on the right side, and for the other half they were mounted on the left.[53]

A press release from October 1924 included statements by Vice President Jules Hauvette-Michelin reinforcing their company's commitment to low-pressure tires. As he explained, of the 111 different auto-

mobile models available on the American market, 68 models—61% of the total—were offered with balloon pneumatic tires, either as original equipment or as an option, with an extra cost. Finally he pointed out:

> "Michelin has now made over 1,000,000 balloon tires. We believe that this is more than have been made by any other manufacturer. But others have made them in considerable quantities, also. It is the record of these tires that accounts for the rapid growth of balloon tire sales today. The period of uncertainty is past. The new tires have proved their superiority." [54]

Evidently the figures provided by Michelin in their publicity texts were often the result of including production from their French, Italian and American factories in the sum, although this was rarely detailed, specified or clarified in numerous press releases or advertisements disseminated to the American public. As such, the conclusions that could be drawn were based on an unequal and confusing comparison. This is seen later, in a news item from January and also in the text of an advertisement in February 1925. They explained that, after a year and a few months since its market launch, and taking into account the joint production of about six million balloon tires manufactured by all companies (in fact, they were referring only to U.S. firms, which in 1924 produced about 5,844,300 balloon tires),[55] Michelin had already reached the figure—and this amount was the sum of all the production from their different factories—of two million balloon pneumatic tires.[56]

Just three months later, in April, Michelin's advertisements certified the trend by explaining that, out of nine million balloon pneumatic tires manufactured by all companies, three million were Michelin.[57] The growth in that year was spectacular, and by the end of 1925, in the U.S. market there was a total number of more than twenty million manufactured balloon tires. The implantation of the balloon model was already a reality in 1925,[58] as confirmed in two inescapable events for the motor world that had been running for 25 years: January 2-10, the New York Automobile Show; and the Chicago Automobile Show, celebrated January 23-31. About 90 % of the cars exhibited in both exhibitions were equipped with this type of pneumatic tire.[59]

In January 1925, the Michelin Tire Co. in Milltown emitted a press release on the results of their own survey to determine the degree of user satisfaction for the first Comfort Cord after a year and a few months of testing. The study and its conclusions, with clear publicity purposes, were also included in the texts of their press advertisements. For the survey, as they explained, several thousand direct customers who were known to have purchased these tires were contacted by mail with a questionnaire. Nearly five hundred responses were received, most of which were enthusiastic about their new pneumatic tires. Many of them claimed to have gained more mileage than with their previous high-pressure tires, adding that "under no circumstances would they want to go back to using ordinary pneumatic tires." Comparing this assessment to Michelin's earlier studies of different high-pressure tire models from other brands, Jules Hauvette-Michelin explained that there was now no doubt about the fact that balloon pneumatic tires offered greater satisfaction than what was previously available on the market.[60]

In France Michelin's balloon pneumatic tires equipped 75 % of the lightweight two-seater cars made by Citroën, Renault and Peugeot in 1924, and the latter planned to convert them into standard factory equipment for their entire range of small cars. In September of that year, 5,200 Paris taxis, operated by the Compagnie Autoplace and Compagnie Generale des Voitures de Place—the two most important businesses of the sector in the French capital—circulated on Michelin Comfort tires. The first company

had a fleet of 3,200 cars, which used detachable wooden wheels with special clincher rims to accommodate the new tires; the second incorporated in their fleet of 2,000 taxis the new pneumatic tires fitted onto Michelin disc wheels.[61]

In remarks to the press in mid-June 1924, just before departing for France from New York and embarking on the vessel named Paris, Jules Hauvette-Michelin expressed his satisfaction:

> "Half of the new cars that come out next year will be equipped with balloon tires [in the U.S.]. Within two or three years fabric and cord tires will pass out of the picture. Fully 50 per cent of the French cars are now equipped with balloon tires."[62]

In Europe, in addition to the early initiatives of Dunlop and Michelin, other companies also followed suit. In the second quarter of 1924, the German company Continental launched their first balloon tires in different sizes.[63] Pirelli put their balloon tire to market at the end of the same year, the Superflex, with its characteristic tread of rubber studs forming the shape of a diamond.[64] Other firms took longer to join the technological race such as the Belgian Englebert, which did not launch their low-pressure model until 1929 (fig. **47**).

10. Clincher versus Straight side

The way in which the tires were fitted to the wheel, the design of covers and the respective type of rim needed constituted the debate that accompanied the evolution of the pneumatic tire from its very genesis. The mix of economic and cultural interests between the industrialists from the automobile and tire sector coming from the Anglo-Saxon world and the European continent were often at odds. The multinational Michelin, with one foot in Europe and another in America, was the protagonist in several of these incidents, such as the dispute between the technology of pneumatic tires and clincher and straight side rim models.

10.1. Pneumatic tires and clincher or beaded-edge rims.

In clincher construction technology, the cross section of the metal rim showed a convex base, with the sides bent upward and inclined inwardly, in the form of a hook. The section of the corresponding cover was omega-shaped, with the edges having a very wide rubber flange, curved upwards as a hook and designed to fit on the metal hook shaped flanks of the rim (fig. **79**). The pneumatic tire's own inflation pressure caused the cover to be firmly fixed to the rim, so that both elements were securely fastened and engaged.

This system was patented in 1889 by William Erskine Bartlett, an American previously engaged in the tea business and who later settled in Scotland, when invited by his brother-in-law Henry Lee Norris. Norris had founded in 1855 the North British Rubber company in Edinburgh along with Christopher Meyer and John Ross Ford, all of them pioneers of the rubber industry and responsible to a great extent for establishing New Brunswick and Milltown as important production centers. Bartlett, who headed the North British management team from 1871 until his death in May 1900, sold his patent to the company.

In 1896 the British Dunlop, determined to legally assure their control and protection of the internal market from foreign competitors—especially Michelin, who in France manufactured clincher tires without restrictions, as the patent was invalidated there—gained the rights for clincher tech-

nology.[65] The operating license was also sold in America, specifically to the Englishman in the United States Thomas Buckland Jeffery who founded in 1899, together with his fellow student and partner R. Phillip Gormully, the G & J Tire Company. This was done with the aim of controlling the exploitation of patents and, secondly, to start production of their own tires.

The acquisition of these rights entailed immediate action against those American companies that offered clincher pneumatic tires—both as manufacturers or distributers—without paying the corresponding royalties. This was the case with the Diamond Rubber Co. in 1902, which after a judicial process was forced to acquire the license, and was set as an example to follow for most firms in the sector. Legal action was also taken against other companies, such as the Pennsylvania Rubber Co.—acquitted of the accusation in 1907—or against importers of the German company Continental's pneumatic tires. In 1904 the great majority of the major pneumatic tire firms had acquired the corresponding license: Hartford Rubber Works, Morgan & Wright, India Rubber, BF Goodrich, Diamond Rubber, Fisk Rubber, Goodyear Tire & Rubber, Continental Caoutchouc and International Automobile & Vehicle Tire Company.

In 1904, G & J initiated a lawsuit against the U.S. Agency of the Michelin Tire Co., the official Michelin agency in the United States, established in January of that year, based in New York and under the direction of Norris Mason (fig. **76**). The reason for the dispute was, of course, the American commercialization of French clincher tires. The proceedings began on September 21, 1904.[66] In March 1905 the defense was taken over by the Michelin Tire American Agency, founded at the beginning of the year by Eben D. Winans, and replacing the previous agency (figs. **77**). Two years later, the French parent company acquired land, infrastructure and patents—supposedly the package was to include the clincher license—from the Milltown International Vehicle & Tire Company and formed its American subsidiary, the Michelin Tire Co. of Milltown after eliminating previous agencies. A 1907 news item reported that proceedings were still ongoing, taking the testimony of parties and following due course. In 1908 the validity of the G & J patents expired.[67]

10.2. Pneumatic tires and straight side or wired rims.

In 1890 the Englishman Charles Kingston Welch patented—British patent number 14,563—a different method of securing the pneumatic tire. The rim section which had a flat base contained flanks bent upwards at right angles and edges slightly inclined outwardly (fig. **57**). The section of the corresponding rubber cover was fixed to the rim because the inside of each of the beaded edges housed a rigid tension steel cable, forming a ring that ran the entire circumference of the cover. Since it was set in the rim—to which an external closing ring was added—the cover was held tightly in position by the force of tension, without depending directly on inflation pressure. Welch sold his patent to Dunlop, and in 1901 the Hartford Rubber Co. from Connecticut, which would eventually become part of the United States Tire Co., received the license for North American territory. The term straight side was coined in the United States as opposed to the clincher [to clinch, join, rivet, close, to fix], the latter being anchored with thick curved hooks.

Different manufacturers offered, based on these two principles, improved versions adapted to their own needs. Many companies started with a basic rim with interchangeable parts to accommodate both the clincher and the straight side sytems. Solutions also flourished that allowed for the quick assembly and dismantling of these rims—using reinforcing rings and side parts with removable pieces—and to facilitate as comfortably as possible changing the cover and repairing or replacing the inner tube. In this sense, the efforts of Firestone and their Safety Universal Rim or Goodyear and their Quick-Detachable

technology, both in 1906, and the *jante amovible* or detachable rim that Michelin popularized that same year in Europe are worth noting (figs. **78-81**).

If in the beginning American firms opted for clincher pneumatic tires and rims, the tendency was reversed during 1910-1912 in favor of straight side technology, whereas in Great Britain and the European continent, they definitively imposed the clincher model. In this way, the United States industry —joined by Great Britain and the territories of Anglo-Saxon influence—and the European one followed different paths which included the standardization of measures, expressed in inches or in the metric system. However, a number of U.S. automakers, headed by Ford—the American company leader in European sales—opted for clincher tires to ensure the acceptance of their vehicles in production destined for the export market.

As for the British Dunlop, there had been a continuous debate since the beginning of the 1920s on whether to definitively adopt the straight side in their domestic market to the detriment of the clincher, anticipating the invasion of American cars equipped with that technology and their need for this type of spare tire. Dunlop equipped 90 % of the cars of British manufacturers in OE—original equipment—, whereas in the disputed and more fragmented market of RE—replacement equipment—, Michelin slightly surpassed them on British territory. Another of the solutions that were developed in parallel was the spare wheel, avoiding uncomfortable repairs on the road and postponing them for later repair at the mechanic shop. Thus, following the example of Britain's Stepney (1905), Rudge-Whitworth (1906) and subsequently Dunlop (1909) offered their detachable wire-spoke wheels in the American market, where other companies launched similar products. In 1920 Michelin popularized their steel disc wheel on both sides of the Atlantic, licensing their invention in the United States to the Budd Wheel Company.

11. Trans … Atlantis

During the war and in the postwar period, France had been 'invaded' by Allied military vehicles, especially the U.S. Army. Vans and trucks transporting supplies and troops, ambulances for health services, limousines and cars for commanding officers … practically all were factory equipped with straight side type rims and pneumatic tires. In addition to this circumstance, the growing and unstoppable importation of cars from U.S. firms—with their corresponding tires—transformed the panorama in which Michelin still reigned. Moreover, the introduction of BF Goodrich in the French market, with their own factory since 1910, added even more weight to the effort of other American companies that began to vigorously position themselves. In the face of this enormous pressure, the French firm began an aggressive campaign against straight-side technology in 1921, counteracting this with their new initiative, the Michelin Steel Disc Wheel, designed to accommodate clincher tires (figs. **81-82**).[68] The initiative took the form of a twelve-page brochure with numerous technical illustrations and comparisons between the two technologies, with the telling title of *Le procès de la jante européenne contre les jantes américaines* [The trial of the European rim against the American rims] (figs. **83-84**).

Michelin insisted on this theme in their ads in the French press. In the magazine *L'Illustration*, Michelin had been inserting since April 1919 a long campaign of modular advertisements that had the generic name of "Le Samedi de Michelin" [Michelin Sunday] because that was the day of the week in which they were published. The advertisements were numbered and each of them addressed a specific theme, often illustrated with drawings of the mascot Bibendum. During March-April 1921, the serial trilogy was published consecutively—"Le 98e Samedi de Michelin," March 19; "Le 99e Samedi de Michelin," March 26, and "Le 100e Samedi de Michelin," April 2. All three ads had the same title of "Trans … Atlantide"

and aimed at raising the awareness of French consumers in light of the American imposition (figs. **85-87**). The poignant texts are signed by the company's authorized spokesman, the faithful Bibendum, who exemplifies the message by starring in several illustrations.

In the following paragraphs, extracted from the complete text of the three advertisements, the central ideas of the message are defined. First, a reaffirmation of pride and a call to patriotic sentiment:

> "It is sufficient that an idea comes from abroad so that we can admire and accept it without hesitation (…). The French are the only people in the world today who do not think they are number one. (…) It is understood that my criticism of the 'Straight Side' deals with its mode of fixation. The quality of the tire is not the issue in this matter, it is as good as its manufacturer wants it to be; in this sense, our American colleagues have nothing to teach us."

What follows is a disqualification that has an ironic comment on the circumstances of American anti-alcohol laws, a ridiculous—and ridiculed—situation for French society and consumers and their well-established wine culture.

> "(…) The American prefers, therefore, the 'Straight Side' … just as he prefers pure water since prohibition law has made him forget the taste of wine; he had no other choice."

To conclude, a solution and service for a defenseless customer is provided, bearing in mind that the issue was also about the profusion of parts and the complexity of rims and mountings for straight side models versus the simplicity of replacing an entire wheel on the other—the Michelin steel disc wheel, of course:

> "(…) If you order a car to be imported from America, demand that it be equipped with the type of pneumatic tires that you are used to. You will never make a better decision. And if you buy a car equipped with 'Straight Side' tires, do not hesitate, replace them before suffering the thousand and one setbacks that I fear the experience of using them will bring to you. Take advantage of the opportunity to equip your vehicle with Michelin disc wheels. Be calm, everything is in order, we have studied and carried out the correct adaptation, which will surely not cause any problems whatsoever."

One paragraph refers to the paradoxical situation of the Milltown subsidiary, created in order to compete in the U.S. market, and thus to manufacture their pneumatic tire covers, disc wheels, parts and tools prepared for straight-side pneumatic tires:

> "I know the 'Straight Side' well, as the Michelin Tire Co. in America manufactures them daily by the thousands. Therefore, with perfect knowledge of cause and total impartiality, I say to you: the Straight Side is not progress, far from it, and the European pneumatic tire will not pave the way for it."

Interestingly, the Michelin Tire Company in Milltown announced to the press on February 18, 1924 the prompt distribution of the first balloon pneumatic tire with clincher technology that appeared in the American market and designed to replace the popular size 30 x 3 ½. The novelty was the Michelin "Comfort Cord" measuring 31 x 4.40, one of the sizes approved by the Rubber Association of America, created in 1896 and of which Michelin was a member. In this way, it was possible to supply the popular

and extensively used lightweight Ford models with factory equipped clincher rims and tires, in a strategic focus aimed at the local market and in particular, for exportation to Europe (figs. **71-75**).[69]

The issues raised by Michelin reflected in their French advertising campaign of 1921 were not left unanswered. In October of that same year, the Rubber Association of America printed more than 50,000 leaflets with the title *Why straight side tires are better* explaining the advantages of straight side pneumatic tire models over the clincher. The twenty-page illustrated pages were published in different languages and ready to be distributed in several countries. The first copies were ready for dissemination at the prestigious International Motor Exhibition, which took place November 4-12 at the Olympia and White City locations in London.[70]

In June of that year the British company Dunlop made the decision to invest more decisively in straight side tires, an attitude also taken on by certain French firms competing with Michelin.[71] Despite the opposition of different car manufacturers, it was estimated that as early as 1925 approximately 25 percent of the automobiles circulating in Britain were equipped with straight side rims and tires, while 75 per cent used clincher.[72]

The U.S. automobile industry and pneumatic tire companies stopped producing clincher tires and covers for OE in 1928, backed by Ford's decision two years earlier to equip their production with straight side models.[73] Obviously, as the demand for RE of clincher tires was maintained, different companies were dedicated to manufacturing them beyond this date. In 1928, 80 % of all U.S.-made pneumatic tires were straight-side tires, a percentage that was expanded successively in the following years: 87.3 % in 1929; 93.7 % in 1930; 98 % in 1931; 99.5 % in 1932 and to 100 % in 1933 (see **TABLE 4**).

In the summer of 1923 there were rumors in the press about the possibility that Michelin, engaged in a commercial and price war against Dunlop on French territory, would consider switching to straight side technology,[74] which was emphatically denied by the firm.[75] By 1925, Michelin finally decided—evoking hygienic amnesia over their previous opposition—to join the mainstream trend of the industry. They began to produce straight side pneumatic tires, redesigning the Câblé and Câblé Comfort models but without abandoning their clincher versions, since it was necessary to continue supplying the replacement market.[76] The new pneumatic tire models were identified on the sidewall of the tire with the letters "SS" [Straight-Sided].

Notes

1. Renault went from producing 5,000 cars in 1913 to manufacturing only 3,500 during the four years of war … but in return they manufactured 9,320 trucks, 1,760 tanks, 12,500 aircraft engines and 1,160 aircraft, 5 million rockets and 8.5 million artillery shields; Smith, p. 405.
2. "Enlarge french automobile factories," *The Automobile*, February 3, 1916.
3. Between January 1915 and the end of 1918, Fiat produced about 50,000 vehicles—30,000 for the Italian army, 15,000 for the French, and 5,000 for the American, English and Portuguese allies—; thousands of 300 and 600 CV engines and airplanes. According to news published in the Italian sport magazine *Stadium* "El esfuerzo de Fiat en la pasada guerra," March 15, and "Los talleres Fiat, de Torino," May 3 of 1919.
4. As Annie Moulin-Bourret (1997) explains in detail in Chapter IX "The Guerre par profits et pertes."
5. Moulin-Bourret (1997), p. 431-432.
6. It is also possible, in the absence of sources and references to corroborate this and with limited and biased information available for this particular section, that an increase in capital was produced by issuing new shares of the Michelin Tire Co., opening up the range of participation by the general public and increasing the company's financial capacity to take on new challenges with solvency.
7. "Michelin extends plant," *The Automobile & Automotive Industries*, September 23, 1920; "Build new storehouse," *The Charleston Daily Mail*, October 8, 1920.
8. "Tire companies increase activity," *The Automobile*, November 23, 1916; "Michelin Tire Company's business has grown most rapidly," *The Fort Wayne Journal-Gazette*, January 28, 1917.
9. "Michelin's new $ 6,000 athletic field ready for formal opening tomorrow," *New Brunswick Times*, June 26, 1914.
10. "Michelin Mastic," *The India Rubber World*, April 1, 1921, p. 494. This was a new type of glue, replacing the usual Mastic made in Milltown since 1909. "The Michelin Tire Company," *The Horseless Age*, November 10, 1909, p. 547.
11. French (1991), p. 16.
12. "In 1899 [in the United States] only 3,720 automobiles were manufactured, and the industry was still incipient in 1904, when 23,000 cars were produced. After 1904 production grew rapidly, especially between 1909 and 1919 when annual automobile production increased from 127,000 to 1.7 million, an annual growth rate of 25.8%." Klepper and Simons (1997), p. 10. The figures provided in the study on the number of U.S. automobile manufacturers are also highly indicative: 37 in 1900; 81 in 1907; and 274 in 1909.
13. French (1991), pp. 17 and 25.
14. The situation in France was more defined and polarized. Michelin's business strategy approach was carried out from a leading position over their two major local competitors, Bergougnan and Hutchinson and their two locally well-established continental rivals, Dunlop and Continental.
15. According to a report in March 1923, the Michelin Tire Company increased their business twice as much as in the previous year, with a workforce of about 2,000 in the factory, which even worked on holidays in three production shifts. "New Jersey," *The India Rubber World*, March 1, p. 379 and 1 April, p. 450, in 1923. Another parameter of comparison, precisely in the year 1921, is the number of workers in the factories of the European company Continental: a total of 10,000 employees (2,327 in 1904, 4,713 in 1909, 7,240 in 1914, 2,938 in 1918 and 6,749 in 1920), as explained in the publication *50 Jahre Continental, 1871-1921*.
16. "Strikers Rush Factory" and "Strikers Quiet at Milltown," September 10 and 11, 1919, *The New York Times*.
17. Copy of the personal letter from Joseph Duigou to his wife, dated November 18, 1920, provided directly by Marie-Hélène Kerneur as part of the family archives. Joseph Duigou was the brother-

in-law of Marie-Hélène Kerneur's grandmother. The original letter belongs to the Coicaud family, grandchildren of Joseph Duigou. Joseph Duigou was born on 1 March 1884 in Roudouallec, in French Brittany. He emigrated to Milltown under contract by Michelin and returned to join the French army during the Great War. He was taken prisoner by enemy forces on May 27, 1918, and eventually returned as a war veteran to Milltown on July 26, 1920. His wife, Louise Duigou —Fichant was her maiden surname—remained in Roudouallec. Joseph Duigou died on February 19, 1922 at St. Peter's Hospital in New Brunswick, New Jersey. Joseph Duigou is portrayed in two of the choral photographs presented in this study: one in the portrait of the French Veterans from Middlesex County and the other, as one of the Michelin Band members. Information provided personally by Marie-Hélène Kerneur.

18. "Michelin brings out non-skid," *The Automobile*, October 14, 1915. "The Michelin Pull," in the newspaper *The Graham Guardian* (Safford, Arizona), June 1, 1917.

19. Jemain (1982), p. 109.

20. Dumond (1993), p. 43.

21. As explained in *Best in the Long Run*, p. 68, listed in the bibliography.

22. Patents number 489,714, January 10, 1893 and number 493,220, March 7, 1893. According to the proceedings of the "Palmer Pneumatic Tire Co. v. Lozier," Circuit Court, N.D. Ohio, E.D. 23 July 1895, Number 5,404.

23. The Palmer Pneumatic Tire Company, created in the state of Illinois on November 2, 1895.

24. Pearson (1922), p. 236; and "New trade publications," *The Indian Rubber World*, February 1, 1903, p. 166.

25. The India Rubber Company, Gutta Percha and Telegraph Works Co. Ltd. was finally acquired in 1933 by the British subsidiary of BF Goodrich, converted in 1935 into the British Tire and Rubber Co. "The British Goodrich Rubber," *The Times*, December 20, 1933, and "British Tire and Rubber Company and associated companies. Administrative history," UK National Archives, www.nationalarchives.gov.uk

26. *The India Rubber World*, December 1, 1902, p. 78.

27. Patents number 18,133 (1902) "Rubber coated thread of cord," and number 753 (1903) "Pneumatic tyre cover," both registered in the British Patent Office, as published in 1904 by *The India Rubber World*, February 1 , p. 162, and 1 July, p. 348. Also registered in the European Patent Office with the following references: GBD190226183 "Improvements in or relating to Rubbered Threads," November 26, 1903 and GBD190300753 "Elastic fabrics," January 7, 1904.

28. A press release dating from the end of 1904 reflects the intention of the tire firm G & J to manufacture an automobile pneumatic tire according to the principles of the Palmer bicycle cover. As such, greater precision in dates would indicate who was the pioneer in this adaptation. "New G & J Tire," *Motor Age*, October 15, 1904.

29. "Diamond Rubber declares dividend," *The Horseless Age*, November 9, 1910; "The rubber trade at Akron," *The India Rubber World*, June 1, 1911, p. 328. For the amount paid, see Busbey's article which is listed in the bibliography.

30. Blackford and Kerr (1997), p. 50.

31. "A group of interesting new cord tires," *The India Rubber World*, March 1, 1919.

32. The date is referenced in several Michelin advertisements, for example in the publication "Lorsque vouz roulez sur 'Câblé' Michelin," *L'Illustration*, October 2, 1920.

33. Nibblet and Reynolds (2005), p. 58.

34. Jemain (1982), p. 109.

35. "Michelin brings out new tire," *Motor Age*, September 8, 1921; "Steel tread tires pass out in France," *The Automobile & Automotive Industries*, June 2, 1921; "European tire construction," *The Automobile & Automotive Industries*, August 25, 1921.

36. "The new General tires ready," *Automobile Trade Journal*, September 1917; "General Cord Tires," *The Horseless Age*, December 1, 1917; "General brings out two new tires, 'Cord' and 'Jumbo'," *Automobile Trade Journal*, March 1918.

37. For Ford automobile users, for example, the price difference between a standard pneumatic "fabric" and "Jumbo" tires was three dollars; for a total extra cost of twelve dollars, an automobile could be equipped with General's four large size tires. This is explained in the text of the advertisement published in *Motor Age*, October 11, 1917.

38. O'Neill (1966), p. 83.

39. For example, a double-page advertisement in *The Saturday Evening Post*, published on March 17, 1923, featured the new Dayton "Thorobred Cords" with a 10,000-mile life guarantee under the motto "A tire-built for underinflation." According to the company, this technology had been developed three years before and had passed a year of strenuous highway and road tests reducing and increasing inflation pressures outside of the normal values. About 300,000 covers had equipped the cars of selected customers, and an investment of $2,000,000 had been made in equipment, new machinery and molds for their manufacture.

40. Lief (1951), pp. 138-144.

41. "Balloon, doughnut, or air-cushion," *The India Rubber World*, November 1, 1923, p. 72; "'Balloon' tire name officially adopted," *Automotive Industries*, November 29, 1923.

42. "Present status of the low pressure tire," *The India Rubber World*, December 1, 1923, p. 144.

43. Ibid, p. 143.

44. "British Dunlop to cooperate in standardization of balloon tires," *The India Rubber World*, November, 1923.

45. "Dunlops to introduce low-pressure tires," *Automotive Industries*, October 11, 1923.

46. "Would stop others from manufacturing balloon auto tires," *The Bradford Era*, June 1, 1925;"Detroit man claims patent of balloons," *Manitoba Free Press*, June 20, 1925; "Awarded patent by U.S. on balloon tire idea," *Cass City Chronicle*, September 11, 1925; "Hate of noise won him a fortune," *Popular Science*, September 1925, p. 49; "Balloon tire suit," *The India Rubber World*, June 1, 1927, p. 159.
In addition to the dossier of the Steel Wheel Corp. v. BF Goodrich Rubber case, accessible at:
http://tn.findacase.com/research/wfrmDocViewer.aspx/xq/fac.19300628_0040084.C06.htm/qx
http://www.leagle.com/xmlResult.aspx?xmldoc=193044842F2d406_1295.xml&docbase=CSLWAR1-1950-1985

47. "Michelin to market cord balloon tires," *Automotive industries*, August 30, 1923.

48. Ibid and "Michelin produces cord balloon tires," *The Indian Rubber World*, October 1, 1923, p. 50.

49. "Cablè Confort," *Bibendum* number 16, September-October, 1923, p. 2 and 3; "Michelin Cablè Confort," *Bibendum* number 17, November-December, 1923, p. 7 and 8.

50. It seems that this decision was supported by the results obtained with their previous models, since a news item from March 1923—in fact it dealt with a press release from the firm's communication service, and as such should be read with certain reservations—stated that the business had doubled over the previous year and the factory, which had about 2,000 employees, was operating tirelessly, with three shifts and without closing for vacations. "New Jersey," *The India Rubber World*, March 1, p. 379, and April 1, 1923, p. 450.

51. According to the advertisement published in *Life* magazine, March 18, 1926; and in *The Recorder-Argus*, August 13, 1926.

52. As explained in detail in the text from a Michelin advertisement published in *The New York Herald*, December 4, 1923, and in the news item "New Jersey notes," *The India Rubber World*, January 1, 1924, p. 251.

53. These data are referenced in various articles and advertising texts, for example, the Michelin booklet published in *The Automobile Trade Journal*, December 1924, p. 120.

54. "Million balloons made by Michelin," *The Washington Post*, August 24, 1924; "One million Michelin balloon tires," *The Indian Rubber World*, October 1, 1924, p. 37.

55. The 5,844,300 balloon tires manufactured in the United States accounted for 11% of the total sum of production for the three different types of technology, compared to fabric (29.7%) and cord (58.8%). See **TABLE 4.**

56. "2,000,000th Michelin balloon tire made," *The Washington Post*, January 25, 1925. "Michelin makes two millionth balloon tire," *San Antonio Express*, February 8, 1925.

57. As explained in the advertisements published in the newspaper *San Antonio Express*, February 15 and 22, 1925.

58. In 1925, the growth of the balloon tire was spectacular (34.1%), tripling the figure from 1924. See **TABLE 4.**

59. "2,000,000th Michelin balloon tire made," *The Washington Post*, January 25, 1925.

60. Ibid. Another news item from 1926, based on a Michelin press release, provided the results of a recent series of tests to determine the effective durability of low pressure or balloon tires compared to high pressure pneumatic tires. After traveling more than one million miles [1,600,000 km approximately], exchanging the balloon tires in different positions, it was verified that their behavior improved in the rear wheels. These offered up to 28% more kilometers, and the front up to 26% more, with an average of 27% more kilometers than the corresponding high pressure modes. "Test shows balloon tires make more miles," *Edwardsville Intelligencer* (Edwardsville, Illinois), April 24, 1926.

61. "Michelin increases balloon tire sizes," *Automotive Industries*, June 5, 1924. "5,200 taxicabs in Paris equipped with balloons," *Automotive Industries*, September 11, 1924.

62. "Michelin in France," *The Indianapolis Sunday Star*, June 22, 1924, p. 63. Jules Hauvette-Michelin was not all that far off the mark in his predictions. In 1925 the balloon covers reached 34.1% of the total sum produced in the United States, in 1926 47.5% and in 1927 they surpassed half of total production (53.9%). In 1928, the last year before being withdrawn, the percentage of fabric technology covers was minimal (0.6%), while cord covers continued to be manufactured, less and less, well into the thirties.

63. "Balloon tires in Germany," *The India Rubber World*, May 1, 1924, p. 547.

64. *The India Rubber World*, December 1, 1924, p. 185.

65. North British Rubber owned the patent for clincher tires invented by Bartlett. In 1896 Dunlop acquired the rights to the invention for £200,000—at that time a considerable amount—but some of the agreements reached included a veto on the Edinburgh company to manufacture tires with Welch's patent technology, which Dunlop also controlled. In return, North British Rubber could continue to manufacture clincher models in Scotland, paying a rate of five shillings for each pair of pneumatic tires. Taking into account that the market was restricted by Dunlop's patents, Michelin reached an agreement in January 1903 with North British to produce Clincher-Michelin at their Clermont factory, awaiting the expiration of patents in late 1904. Dunlop sued North British Rubber but lost the litigation as the court considered that Michelin was only an intermediary, a manufacturing agent that produced the tires that North British required for their business. "Motor tires for England made in France," *The India Rubber World*, January 1, 1904, p. 122; "Scotland's great rubber factory," *The India Rubber World*, April 1, 1909, p. 237-239.

66. The indictment against Michelin referred to six patents, five by Thomas B. Jeffrey, issued between 1891 and 1896—number 454,115, July 16, 1891; number 466,565, January 5, 1892; number 466,789, January 12, 1892; number 523,314, July 17, 1894; and number 558.956, April 28, 1896—and one by W. Golding—number 493,160, issued March 7, 1893. *The India Rubber World*, December 1, 1903, p. 99; "G & J Tire Co. lose a suit," *The India Rubber World*, October 1, 1907, p. 23. "Adverse decision in tire patents case," *The Automobile*, September 26, 1907.

67. "Trade news notes," *The India Rubber World*, November 1, 1907, p. 60.

68. In "Trans … atlantide," *L'Illustration*, March 19, 1921. Various articles appeared in the French press questioning the straight side technology and signed by several French authors (of course, within the sphere of loyalty to Michelin): Baudry de Saunier at *Omnia*, May 1920, C. Faroux at *La Vie Automobile*, December 25, 1920, and Mortimer-Megret at *Pratique Automobile*, January 15, 1921.

69. "Michelin announces clincher balloon tires," *Automotive Industries*, February 21, 1924.

70. A June 1921 news report states: "The recent agitation against the straight side tire in France has brought the matter to a head, and it seems that there will be from now on persistent rivalry for supremacy," "A notable victory for the straight side tire," *The Automobile and Automotive Industries*, June 23, 1921. "New trade publications," *The India Rubber World*, January 1, 1922.

71. Ibid.

72. Michelin's UK representatives estimated the market division as 20 % straight side versus 80 % clincher, although the approximation was probably based on data from their own sales. "The rubber trade in Europe," *The India Rubber World*, February 1, 1925, p. 303.

73. "Clincher rims are passing," *The India Rubber World*, April 1, 1928.

74. "Michelin may campaign for straight side tires," *Automotive Industries*, July 26, 1923, p. 197.

75. "Michelin to market cord balloon tires," *Automotive Industries*, August 30, 1923.

76. Norbye (1982), p. 87.

Bibliography

Blackford, Mansel G.; Kerr, Kathel Austin.
BF Goodrich. Tradition and Transformation, 1870-1995.
Columbus: Ohio State University Press, 1996.

Buenstorf, Guido; Klepper, Stephen.
"Heritage and agglomeration: the Akron tire cluster revisited,"
Papers on Economics & Evolution. Jena, Germany: Max Planck Institute of Economics, 2005.

Busbey, Ralph C. "Rubber," *A centennial history of Akron*, 1825-1925.
Akron, Ohio, Summit County Historical Society, 1925, pp. 313-345.

Carlsmith, Leonard E. *The Economic Characteristics of Rubber Tire Production*.
Doctoral thesis. New York: Columbia University, 1934.

Couderc, Pierre. *Dunlop-Montluçon. 75 Ans d'Histoire Partagée*.
Aurillac, France: self-published, 1996.

Baudry De Saunier, Louis. "Le Cablé. Un grand progrès dans le pneumatique,"
Omnia magazine, August 1920.

Dumond, Lionel, Lamy, Christian; Gueslin, André; Mazataud, Pierre.
Michelin, les Hommes du Pneu. Les Ouvriers Michelin, à Clermont-Ferrand, de 1889 à 1940.
París: Éditions de l'Atelier-Éditions Ouvrières, 1993.

French, Michael J. "Structural change and competition in the United States tire industry, 1920-1937," *The Business History Review*, volume 60, number 1, Spring 1986, pp. 28-54.

French, Michael J. *The U. S. Tire Industry. A History*. Boston: Twayne Publishers, 1991.

Gaffey, John Dean. *The Productivity of Labor in the Rubber Tire Manufacturing Industry*. New York: Columbia University Press, 1940.

Gettell, Richard Glenn. *Pluralistic Competition: with an Illustrative Case Study of the Rubber Tire Industry*. Doctoral thesis. Berkeley: University of California, 1933.

Jouas, Josette. *Ces Bretons d'Amérique du Nord*. Rennes: Éditions Ouest-France, 2005.

Klepper, Steven; Simons, Kenneth L. "Technological extinctions of industrial firms: an inquiry into their nature and causes," *Industrial and Corporate Change*, March 1997, pp. 379-460.

Leigh, Warren W. *Some Marketing Problems of the United States Automobile Tire Industry and Some of their Effects Upon That Industry Since 1922*. Doctoral thesis. Evanston, Illinois: School of Commerce, 1936.

Lief, Alfred. *The Firestone Story*. New York: Whittlesey House-McGraw-Hill, 1951.

Mom, Gijs. "Conceptualising technical change: alternative interaction in the evolution of automobile," *Tackling transport*, London: NMSI Trading Ltd, 2003.

Nesbit, Willbur D. *The Golden Year of Goodrich. 1870-1920, Fiftieth Anniversary*. Akron, Ohio: BF Goofrich Rubber Company, 1921.

Norbye, Jan P. *The Michelin Magic*. Blue Ridge Summit: Pennsylvania, Tab Books, 1982.

O'Neill, Dennis J. *A Whale of a Territory. The Story of Bill O'Neil.* New York: McGraw Hill, 1966.

Pearson, Henry C. *Pneumatic Tires. Automobile, Truck, Airplane, Motorcycle, Bicycle.* New York: The India Rubber Publishing Co., 1922.

Smith, Michael Stephen. *Modern Business Enterprise in France, 1800-1930.* Cambridge, Mass.: Harvard University Press, 2006.

Spriegel, William Robert. *Replacement Demand for Automobile Tires.* Doctoral thesis. Michigan: University of Michigan, 1934.

Works Progress Administration. *History of Milltown*. Washington D.C.: U. S. Government Printing Office, 1936. Document published from the original in typewritten format and presented to the Milltown Historical Society by Linda Matlack Butch.

Best in the long run. What? Goodrich pneumatic tires: embracing the history of pneumatic tire development for bicycle, automobile and motorcycle uses, and the story of Goodrich pneumatic tires, including their manufacture. Akron, Ohio: Sales Training Department-BF Goodrich Rubber Company, 1918.

50 Jahre Continental 1871 - 1921. Gedenkbuch zum 50jährigen Bestehen der Continental Caouchouc und Gutta Percha Companie. Hannover: Continental, 1921. Commemorative work published by the company.

"All engineers not in entire accord on value of 'balloon' tire,"
Automotive Industries, June 23, 1923, pp. 1419-1424.

"Balloon tire progress to date," *The India Rubber World*, December 1, 1924, pp. 141-142.

"Clincher rims are passing," *The India Rubber World*, April 1, 1928, pp. 67 and 68.

"Clincher vs. straight side tires," *The Horseless Age*, February 3, 1915, p. 167.

"How balloon tires may affect the industry," *The India Rubber World*, February 1, 87-288.

"International discussion of clincher and straight-side tires," *The India Rubber World*, 1920, p. 796.

"Present November situation regarding balloon tires,"
The India Rubber World, November, November 1, 1924, pp. 73-74.

"Present status of low pressure tires," *The India Rubber World*, December 1, 1923, pp. 143-145.

"Straight-side tires for foreigner markets," *The India Rubber World*, July 1, 1919, p. 554.

"Straight side vs. clincher," *The Automobile*, November 23, 1916, p. 880.

"Thomas Buckland Jeffery," *The India Rubber World*, May 1, 1910, p. 287.

"What the balloon tire offers you," *Popular Science*, November, 1923, p. 75.

TABLE 1: NUMBER OF U.S. MANUFACTURERS IN THE TIRE SECTOR, BY YEAR (Approximate figures)

1916	128 companies[0]	
1918	148 companies[1]	
1919	177 companies[1]; 190 companies[2]	200 factories[4]
1920	210 companies[1]; 164 companies[3]	
1921	211 companies[1]; 160 companies[2]	178 factories[4]
1923	205 companies[1]; 166 companies[2]	160 factories[4]
1925	112 companies[1]	126 factories[4]
1927	99 companies (Manufacturers only)[1]	109 factories[4]
1928	83 companies (Manufacturers only)[1]	
1929	62 companies[2]	91 factories[4]
1931		54-48 factories[5]
1933	35 companies[2]	44 factories[4]

The list proposed here is an approximation of the number of existing companies in the corresponding year. The data have been compiled from different sources, including:

(0) *Polyglot Rubber Trade Directory of the United States and Canada*, 1916, pp. 157-165. New York: The India Rubber World Co., 1916. The section classifying products that were manufactured by rubber industrialists lists, in a single group and without differentiating them, the companies manufacturing solid rubber and pneumatic tires. On the other hand, it classifies the manufacturers of inner tubes in a different category that includes other accessories ("Inner Tubes and Tire Accessories").

(1) *The Tire Rate Book*, a quarterly publication, in its 1918 (October), 1919 (October), 1920 (April), 1921 (April), 1923 (April), 1925 (October), 1927 (October) and 1928 (July-October) editions. New York: The Class Journal Company.
There is a caveat for the figures extracted from this publication. Although initially they do not include the industries dedicated to manufacturing solid rubber tires or those making motorcycle tires, the lists for some years do not discriminate between companies that were manufacturers and those that only commercialized pneumatic tires. Not all tire companies had their own factory. It was customary for a company to commercialize their brand, but it commissioned the production to a specialized industry, which also occurred with mail order companies and automobile accessory chain stores. Moreover, in this publication the list is often the one for different tire brands present in the market although several correspond to the same manufacturer, and as such, corrections were made for the duplication of those companies that were repeated. It should also be noted that companies that were in fact subsidiaries, divisions or part of a single corporation, as in the case of Federal with Fisk, are listed separately as independent companies.

(2) French (1991) p. 45.

(3) "Pneumatic tire prices," *Automobile Trade Journal*, volume 24, number 7, January 1920, pp. 281-289.
Comprehensive comparative list of companies in the sector and the prices of their respective pneumatic tires

(4) Carlsmith (1934), p. 108 (Table XXI) and 171 (Table XXXIX); French (1991), p. 30.

(5) Spriegel (1934), p. 28 (Table 5) considers that in 1931 there were 54 factories, while Carlsmith (1934), counts 48.

Notes to Table 1.

It is difficult to determine the number of companies that existed before 1919 dedicated to manufacturing tires, since official censuses did not differentiate the diversified industries of rubber derivatives in the global figures until the 1921 census. It was then that a section was established that consisted of the "Tire and Tube Industry" (which did not make distinctions between companies that manufactured only inner tubes and those that manufactured pneumatic covers and inner tubes). What's known is that between 1914 and 1918 fifty-five new tire companies were created, but it is not specified which of these companies were solvent beyond the specified time period. Authors such as Klepper (2002) have developed and worked on a list of all tire-producing companies created between 1905 and 1980, a total of 607, drawing mainly on annual publications. In March 2009 I contacted Stephen Klepper and his collaborator Guido Buenstorf who kindly explained to me that the list—yet unfinished—was a basic tool of their research and that they were not yet in a position to share it with other researchers. Let's hope someday their work will be made public, so as to enrich further knowledge on the subject.

TABLE 2: RANKING OF AMERICAN PNEUMATIC TIRE INDUSTRY COMPANIES ACCORDING TO THEIR DAILY PRODUCTION CAPACITY (1920-1922)

FIRST LEVEL Large companies, with daily production capacity above 10,000 tires	Goodyear ..... 25,000 u/d BF Goodrich ..... 20,000 u/d US Rubber ..... 20,000 u/d Firestone ..... 18,000 u/d Fisk ..... 15,000 u/d
SECOND LEVEL Medium-sized companies, with production capacity between 1,000-10,000 tires per day	Ajax ..... 10,000 u/d Miller ..... 7,000 u/d Kelly-Springfield ..... 7,000 u/d Republic ..... — McGraw ..... — Pennsylvania ..... — Mansfield ..... — General ..... — Dayton ..... — **MICHELIN ..... 4,500 u/d** [1] Mason ..... 2,500 u/d [2] Seiberling ..... 2,400 u/d [3]
THIRD LEVEL Other significant companies with lower production capacity (unspecified)	Hood ..... — Gillette ..... — Cooper ..... — Mohawk ..... — Gates ..... — Pharis ..... — Dunlop ..... —
FOURTH LEVEL, comprising more than one hundred small companies	

Notes to Table 2.

The list of companies in this table organized by levels was proposed by Buenstorf and Klepper (without the detailed production figures, which have been added here) in the study included in the bibliography, based on the categories established by French (1986) in "Structural change and competition in the United States tire industry, 1920-1937," pp. 30-32, and *The U.S. Tire Industry*, p. 43-44, complementing and enriching it with the contribution of other sources. None of these authors specifies Michelin's position in the list, given that Michelin is even included.

The estimation of the productive tire capacity per day in 1920 for the first eight companies on the list has been taken from the table "Daily plant capacity of selected tire companies at selected dates," Leigh (1936), p. 17. The data on the rest are based on news published in the specialized press of the time:

(1) At its height (1922-1925), the American subsidiary of Michelin manufactured 4,500 tires and 15,000 pneumatic inner tubes within twenty-four hours, as can be read in the Works Progress Administration report *History of Milltown*. Washington D.C., U.S. Government Printing Office, 1936, pp. 32-33 and in *Ces Bretons d'Amérique de Nord*, p. 71. Could we then place Michelin as a company belonging to the second level of the table? I have considered it as such.

(2) The news published in *The India Rubber World*: "Miscellaneous Ohio notes," September 1, 1921, p. 926, speaks of 2,000 u/d, while the same section dated October 1, p. 52, cites 2,500 u/d. The same publication, in December 1922, "Mason increase tire prices," p. 174, shows an increase in production, reaching 5,000 u/d.

(3) *The India Rubber World*, June 1, 1922, p. 632.

It is also surprising that Buenstorf and Klepper did not include, especially for the third level, certain companies that are likely to be equivalent to those named. This is the case, for example, of Lee Tire & Rubber, with a factory in Conshohocken, Pennsylvania that in 1923 acquired a weakened Republic Rubber (the ninth position in the table). According to news published in 1921 in *The India Rubber World*, "The Lee Tire and Rubber Co.," January 1, p. 276, and "News of the American rubber industry," August 1, p. 837, their production in the spring-summer months of 1921 was 2,000 tires per day with a potential capacity of 2,500, and a workforce of 900 employees.

TABLE 3: U.S. PNEUMATIC TIRE MANUFACTURERS AND PRODUCTION OF BALLOON TIRES IN GIVEN SIZES (October 1923).

	Measures of standardized rims, in inches							
	28 x 4	29 x 4 ½	30 x 5	32 x 6	34 x 7	36 x 8	38 x 9	40 x 10
Ajax		■						
Armstrong				■	■	■		
Brunswick		■		■	■			
Corduroy		■						
Empire		■						
Firestone		■	■	■	■	■		
Fisk		■	■	■	■	■		
General		■	■	■	■	■		
Goodrich	■		■	■	■	■		
Goodyear		■	■	■	■	■	■	■
Hewitt	■	■	■	■				
Horseshoe		■	■					
India				■				
* **MICHELIN**		■	■					
Miller	■	■	■	■	■	■	■	
Mohawk					■			
Pennsylvania		■	■	■				
Racine		■						
Superior			■	■				
United States		■	■					
Vitalic			■					

* **Annex to TABLE 3:** Correspondence between the standard sizes of cord tires and the special measures offered only by Michelin in their balloon model Comfort Cord, for tire replacement without requiring any modification of the rim.

STANDARD CORD TIRE SIZES	MEASURES OF MICHELIN'S COMFORT CORD
31 x 4 / 32 x 4 ½ inches	33 x 5.70 inches
32 x 4 / 33 x 4 ½ inches	34 x 5.70 inches
33 x 4 / 34x4 ½ inches	35 x 5.70 inches
32 x 4 ½ / 33 x 5 inches	35 x 6.60 inches
34 x 4 ½ / 35 x 5 inches	37 x 6.60 inches

Notes to Table 3.

The list appears reproduced in different publications of the motor world: *Automotive Industries*, October 11,1923, p. 759; "Present status of low pressure pull," *The India Rubber World,* December 1, 1923, p. 145 (where the annexed table depicted above is also included). The original source is the compilation that appeared in *The Tire Rate Book*, published by Class Journal Company.

TABLE 4: ESTIMATED PRODUCTION OF THE U.S. AUTOMOTIVE PNEUMATIC TIRE INDUSTRY, BY TYPES OF TECHNOLOGY (1910-1933).

		Construction technology			Rim technology	
YEAR	COVERS (units)	FABRIC (%)	CORD (%)	BALLOON (%)	CLINCHER (%)	STRAIGHT SIDE (%)
1910	2,400,000	100.0	0.0	0.0	98.0	2.0
1911	3,000,000	100.0	0.0	0.0	96.7	3.3
1912	5,000,000	99.0	1.0	0.0	93.0	6.0
1913	6,000,000	98.0	2.0	0.0	91.0	9.0
1914	8,020,000	97.0	3.0	0.0	90.0	10.0
1915	12,000,000	95.0	5.0	0.0	89.0	11.0
1916	18,560,000	92.0	8.0	0.0	87.5	12.5
1917	25,840,000	90.0	10.0	0.0	85.0	15.0
1918	23,000,000	85.0	15.0	0.0	80.0	20.0
1919	32,840,000	75.0	25.0	0.0	75.0	25.0
1920	32,400,000	65.0	35.0	0.0	70.0	30.0
1921	27,300,000	60.0	40.0	0.0	65.0	35.0
1922	40,930,000	51.4	48.6	0.0	58.8	41.2
1923	45,430,000	42.6	55.4	2.0	61.0	39.0
1924	50,820,000	29.7	58.8	11.5	57.2	42.8
1925	58,780,000	14.1	51.8	34.1	50.8	49.2
1926	60,120,000	5.3	47.2	47.5	40.7	59.3
1927	63,550,000	1.5	44.6	53.9	28.6	71.4
1928	75,530,000	0.6	33.0	66.4	19.6	80.0
1929	69,810,000	0.0	25.2	74.8	12.7	87.3
1930	50,970,000	0.0	16.9	83.1	6.3	93.7
1931	48,740,000	0.0	14.2	85.8	2.0	98.0
1932	40,090,000	0.0	12.2	87.8	0.5	99.5
***1933**	45,300,000	0.0	10.8	89.2	0.0	100.0

Notes to Table 4.

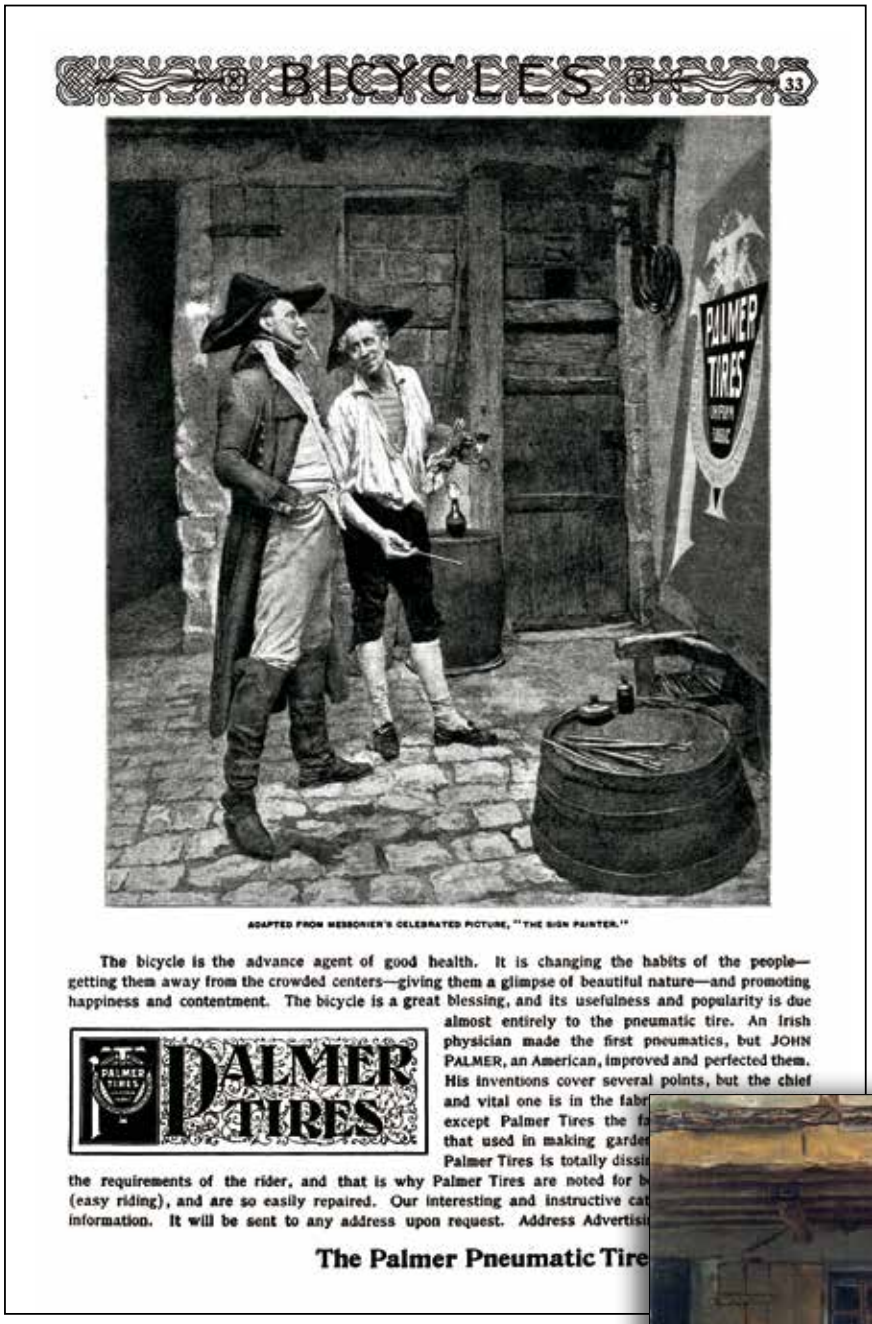
The data represented here are based on Table 22, "Estimated production of automobile casings, by types, 1900-1936," Gettell (1933), p. 222; Table XII, "Estimated production of automobile casings by types" and Table XVI, "Automobile tire production in the United States, 1910-1933," Carlsmith (1934), pp. 92 and 100; and Table I, "Physical volume of production of the tire industry, 1910-1938," Table IV, "Estimated production of automobile tire casing by types, 1910-1936," Gaffell (1940), pp. 36 and 43.

* The data provided by the first two authors, derived from similar and conveniently bibliographed sources, differ only slightly in the 1933 estimate, in which Gettell attributes 11.9 % production to cord covers and 88.1% balloons whereas Carlsmith cites 10.8 % for cord and 89.2 % for balloon production. Gaffell, for his part, gives more precise figures, which differ slightly (in a maximum variability range of 4,000 units for pneumatic covers).

SYMBOL OF VICTORY.

The advertisements for the Palmer Pneumatic Tire Company used the image of the palmer, making a play on words with the surname of the company's founder, John Fullerton Palmer. The word "palmer" actually identified the pilgrim who, after visiting the Holy Land, carried a palm leaf as a sign of his pilgrimage. His characteristic outfit was the one shown in the advertisement on the left: felt hat, short cape, sandals and a cane to lean on during his sojourn. The palm is an ancient symbol of triumph and fame that Christianity adopted to represent the victory of the martyrs over sin and evil. As we can see in the example above, BF Goodrich maintained the character in the first advertisements for their "Silvertown Cord" tires, manufactured in 1915.

1. Advertisement of Goodrich Silvertown tires for motor vehicles in *House & Garden* magazine, July 1916.
2. Advertisement for the Palmer Pneumatic Tire Company's bicycle tires in *The Outlook,* 1897.


BICYCLES 33

ADAPTED FROM MESSONIER'S CELEBRATED PICTURE, "THE SIGN PAINTER."

The bicycle is the advance agent of good health. It is changing the habits of the people—getting them away from the crowded centers—giving them a glimpse of beautiful nature—and promoting happiness and contentment. The bicycle is a great blessing, and its usefulness and popularity is due almost entirely to the pneumatic tire. An Irish physician made the first pneumatics, but JOHN PALMER, an American, improved and perfected them. His inventions cover several points, but the chief and vital one is in the fabr
except Palmer Tires the fa
that used in making garde
Palmer Tires is totally dissi
the requirements of the rider, and that is why Palmer Tires are noted for b
(easy riding), and are so easily repaired. Our interesting and instructive cat
information. It will be sent to any address upon request. Address Advertisi

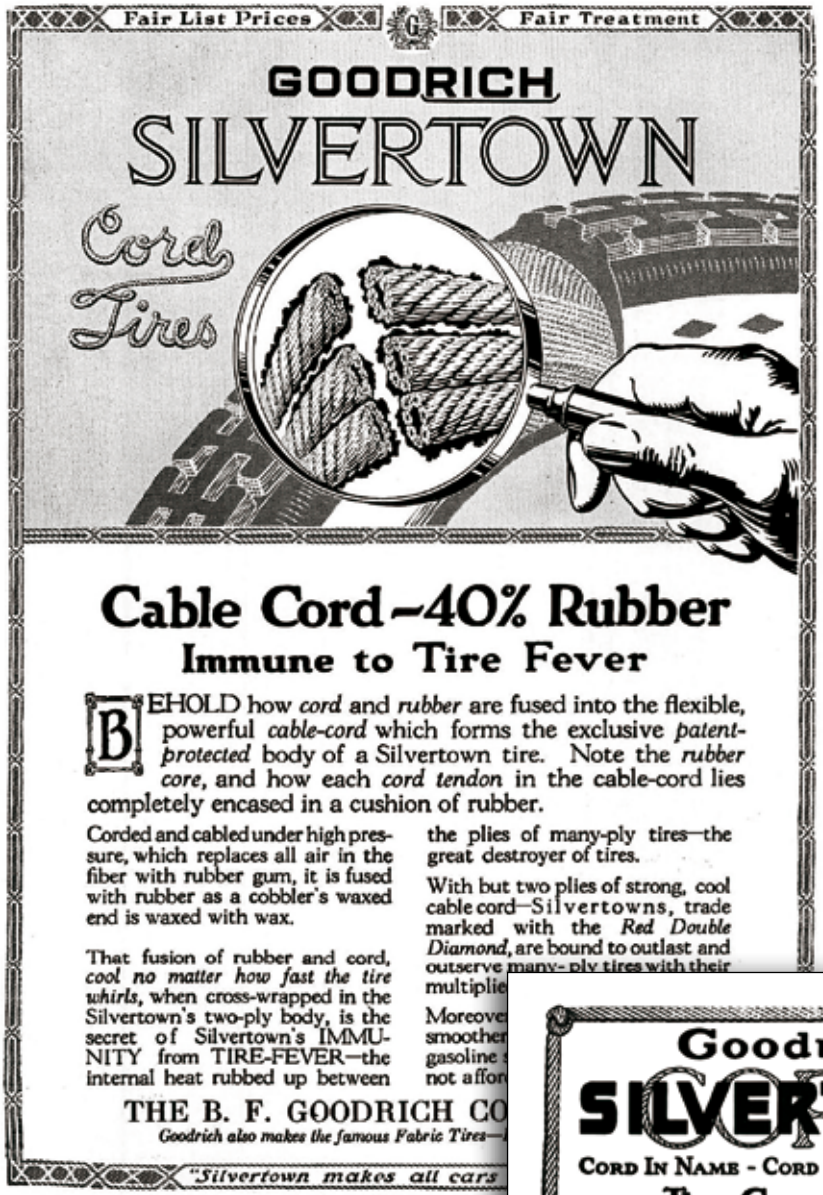
PALMER TIRES

The Palmer Pneumatic Tire

THE EMBLEM DESIGNER.
The advertisement for American bicycle tires of the Palmer Pneumatic Tire Co. recreated the famous painting *Le Peintre d'Enseignes* by renowned artist and historical painter Jean-Louis-Ernest Meissonier. The work of the French painter was known to the American public thanks to the promotion of his work realized in the U.S. by his gallerist, the prestigious Georges Petit. In the original canvas, shown on the right, the owner of a tavern revisits the work of the artist who has created an insignia—portraying Bacchus sitting on a barrel—to represent his establishment. In the advertisement shown above, the classical character is replaced by the emblem of Palmer.

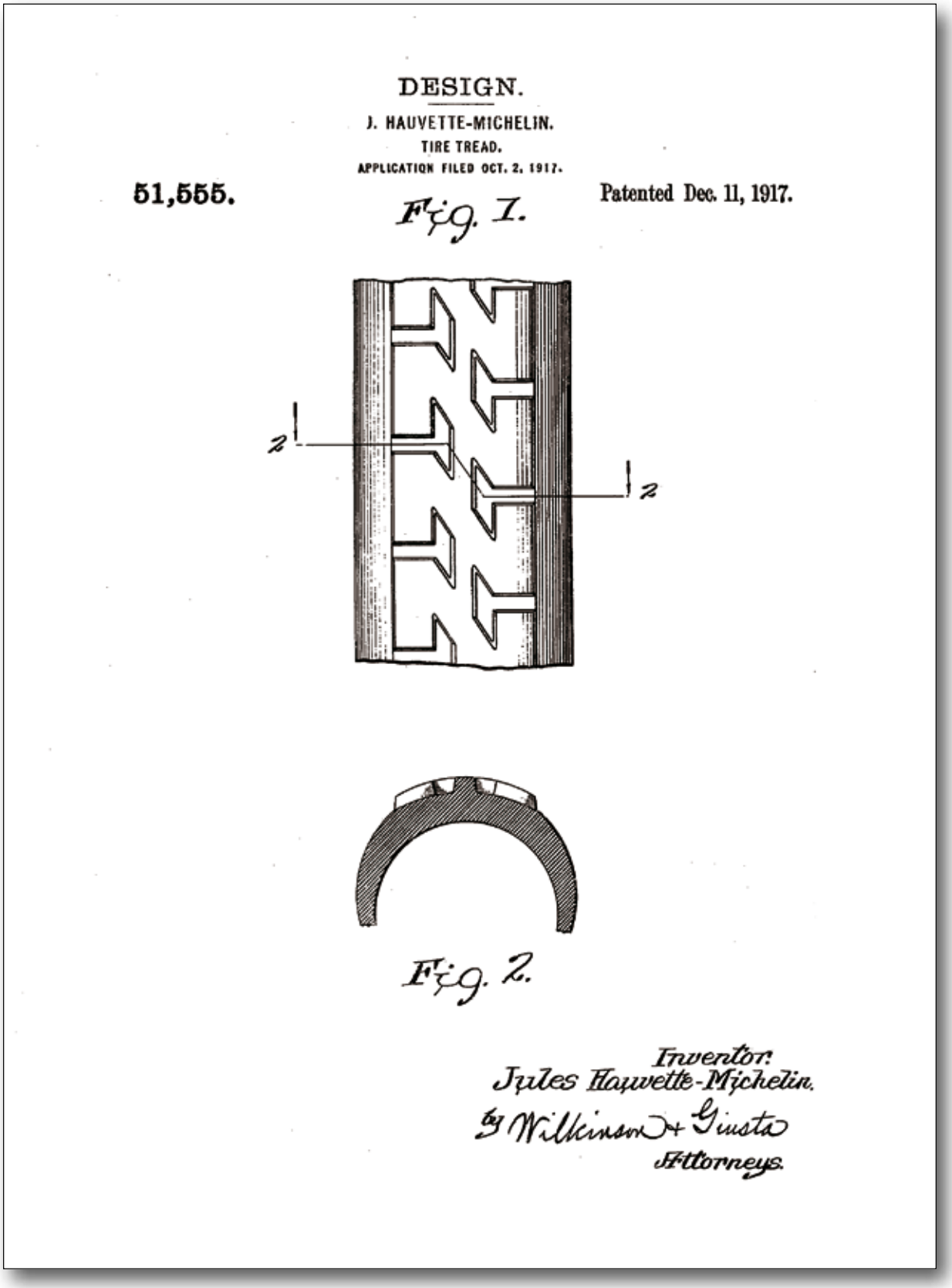
3. Advertisement for the Palmer Pneumatic Tire Co. in specialized magazine on bicycle tires, June 1897.
4. Emblem of the Palmer Pneumatic Tire Company.
5. *Le Peintre d'Enseignes,* oil painting dated 1872 by Jean-Louis-Ernest Meissonier (1815-1891). Kunsthalle, Hamburg.

6. Advertisement published in *The American Magazine*, 1917.



THE CORD TIRE.
The constructive principle of parallel cords that were characteristic of pneumatic cord covers constituted a selling point utilized by all companies. They were often reflected in the graphics and typography of advertisements and in logos of the corresponding models, as can be seen in the examples shown on this page.

7. Advertisement for BF Goodrich in *Rotarian,* June 1917. **8.** Advertisement for the British tires Palmer Flexicord in *The Times,* February 27, 1923. **9.** Advertisement for BF Goodrich in *Scientific American,* May 1, 1915.



DESIGN.

J. HAUVETTE-MICHELIN.

TIRE TREAD.

APPLICATION FILED OCT. 2, 1917.

51,555. Patented Dec. 11, 1917.

Fig. 1.

Fig. 2.

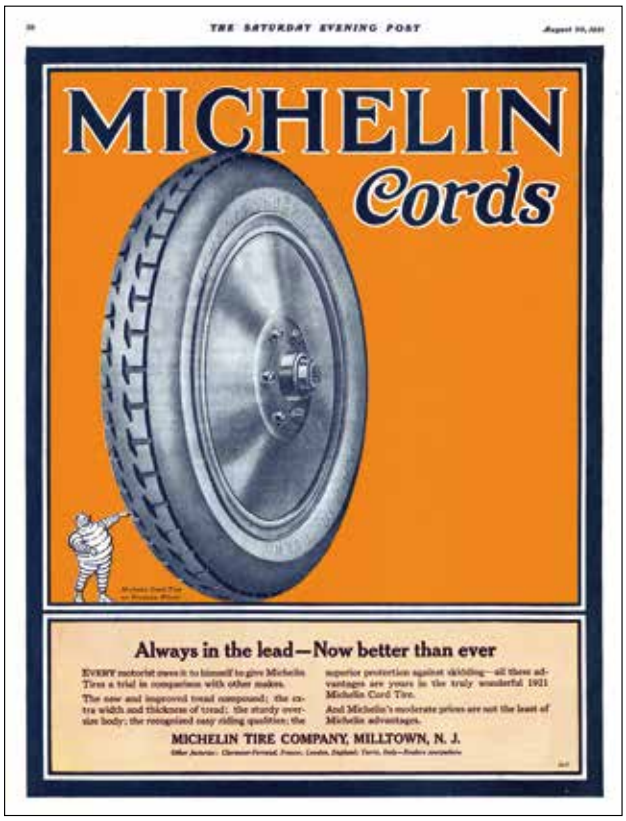
Inventor:
Jules Hauvette-Michelin.
by Wilkinson & Giusta
Attorneys.

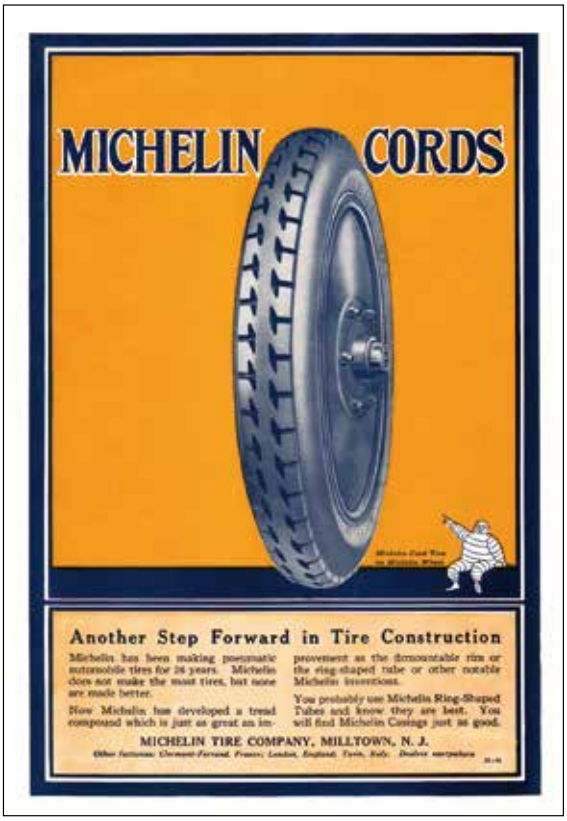
PATENTED DRAWING. The image above depicts the sketch of Michelin's Universal Cord cover model, in the patent filed on October 2 by Jules Hauvette-Michelin, Vice President of the Michelin Tire Co., and awarded on December 11, 1917.

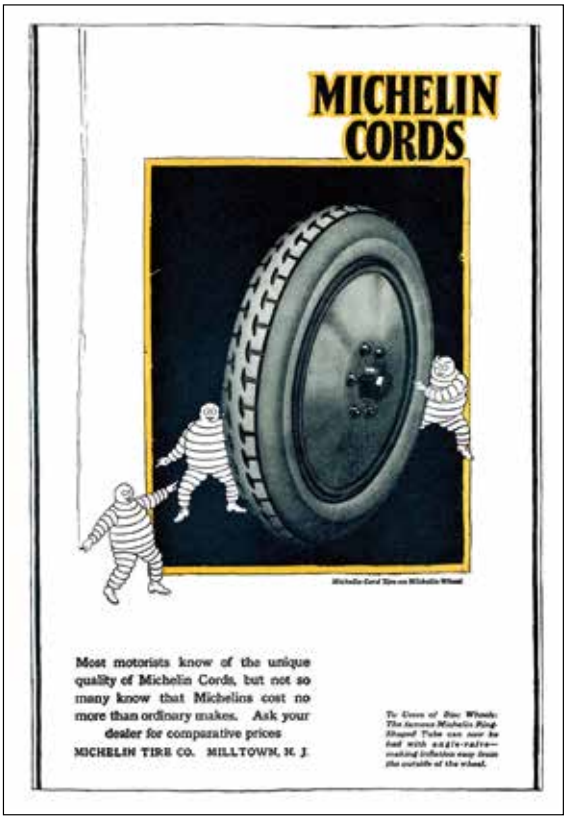
10. First illustrated page of the two that constitute the American patent number 51,555 by Michelin, 1917.

DOUBLE LAYER. Above, one of the first advertisements from January 1920 which inaugurated the intense launch campaign for the new Michelin Double Cord tires, later renamed Michelin Universal Cord.

11. Full page advertisement published in the magazine *The Literary Digest,* January 17, 1920.

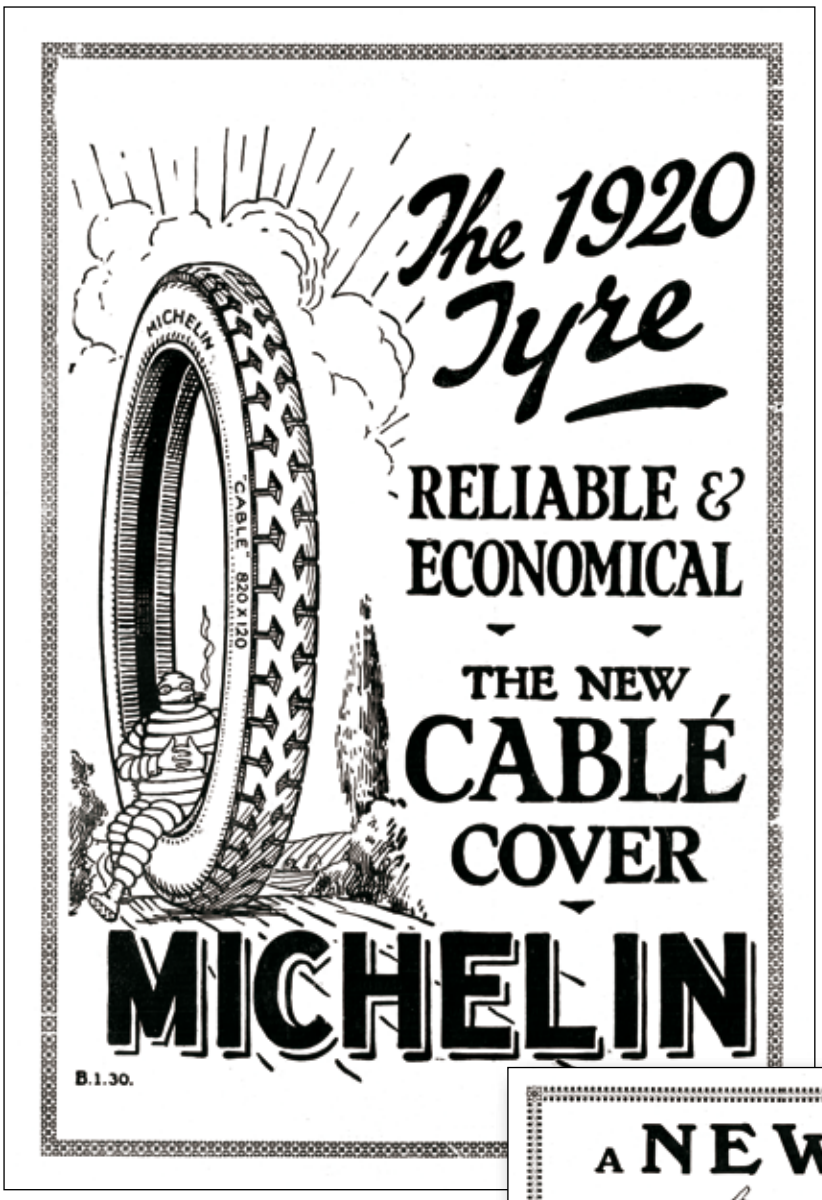






TWO COLORS. The Michelin Cord advertisements were characterized in 1921 by the powerful use of corporate colors—blue and gold—while in another 1922 series, the use of color was restricted to the title and illustrations set on a white background.

12-13. Advertisement in *The Saturday Evening Post,* August 20, 1921, and *The Literary Digest,* September 17, 1921.
14-15. Advertisements in *The Saturday Evening Post,* April 1, 1922, and *The Literary Digest,* September 23, 1922.



COORDINATED LAUNCH.
Michelin Cord pneumatic tire covers appeared in the British market at the beginning of 1920, under the name Michelin Cablé and were accompanied by an intense publicity campaign in the press, in which Bibendum played a key role as ambassador of the product. Production was carried out entirely at the Italian factory in Turin.

16. Advertisement in *Country Life,* April 3, 1920.
17. Advertisement in *The Sketch,* January 21, 1920.

INTRODUCTION. The model known as Michelin Cord and later Universal Cord in the United States market, was named Michelin Câblé in France, where, as the above pamphlet shows, it was launched in December 1919.

18. French promotional pamphlet, with illustrations by Georges Hautot, 1920.

THE HISTORY OF WHEELS. The above image depicts Bibendum presenting Michelin's technological advances and their successive proposals for types of pneumatic tires, which eventually led to the Cáblé model. It can also be seen that ever since 1916 the steel disc wheel had been incorporated as a support for the RU model, and that the flagship Semelle model with non-skid metal studded treads—a technology that was definitely in extinction—was adapted to the new cord cover.

19. French fold-out brochure by Michelin. Illustrations by Georges Hautot, c. 1922.

20-21. Advertisements by Continental's British affiliate published in the English magazine *The Illustrated London News,* 1914.
22. Advertisement in *The Manchester Guardian,* July 23, 1914. **23.** Advertisement in *The Illustrated London News,* February 14, 1914.

April 6, 1912 AUTOMOBILE TOPICS 403

Which Tire?

No-Rim-Cut Tire
10% Oversize

Here is the Goodyear No-Rim-Cut tire—the hookless tire—the oversize tire.

The tire that cuts tire bills in two.

More than one million have been tested out. As a result, this tire outsells any other tire in existence.

The Passing Type
No Oversize

This is the old type—the hooked base tire—which No-Rim-Cut tires are displacing.

23 per cent of these tires become rim-cut.

Yet these tires—wasteful and worrisome, and of lesser capacity—cost the same as Goodyear No-Rim-Cut tires.

Hookless Tires

Note that these tires have no hooks on the base.

They do not, like old types, need to hook into the rim flanges.

So your removable rim flanges are slipped to the opposite sides. Then they curve outward, not inward.

This tire, when wholly or partly deflated, rests on a rounded edge, and rim-cutting is made impossible.

126 Braided Wires

In the base of this tire run six flat bands of 126 braided wires.

They are vulcanized in to make the tire base unstretchable.

The tire can't come off because the base can't give. Nothing can force it over the rim flange. So hooks or tire bolts are not needed.

But, when you unlock and remove one of the flanges, the tire slips off like any quick-detachable.

It slips off much easier, because there are no hooks to "freeze" into the rim flanges.

10% Oversize

To take care of your extras—to give you an over-tired car—we make these tires 10 per cent over the rated size. And without extra charge.

That means 10 per cent more air—10 per cent added carrying capacity. That saves the blow-outs due to over-loading. This 10 per cent oversize, under average conditions, add 25 per cent to the tire mileage.

We Control It

This braided wire feature, which makes this type possible, is controlled by the Goodyear patents.

Single wires have been used—twisted wires have been used—to get this unstretchable tire base. But results are unsatisfactory.

These bands of braided wires, which need no welding—which cannot break or loosen—form the only way known to make satisfactory tires of this type.

No-Rim-Cut tires are satisfactory. Be careful to get them when you change to this type.

On Same Rims

This old-type tire—this clincher tire—is on the same rim as the No-Rim-Cut tire.

All standard rims take either type.

But the removable rim flanges are here set to curve inward—to grasp the hooks in the tire base and hold the tire on.

When this tire is wholly or partly deflated the thin edge of the flange digs into it. That is the cause of rim-cutting.

If this tire is punctured or run soft, it may be wrecked very quickly, and beyond repair.

GOODYEAR
No-Rim-Cut Tires
With or Without Non-Skid Treads

Doubled Cost

This type of tire, under average conditions, means to double our tire cost over our new type.

It comes in this way:

Statistics show that 23 per cent. of all ruined clincher tires are rim cut.

And the smaller capacity, with the average car, cuts tire mileage 25 per cent.

These are net losses, because No-Rim-Cut tires now cost no more than other standard tires.

The 13-Year Tire

Goodyear tires as made today are the final result of 13 years spent in tire making.

We have compared in that time some 240 formulas and fabrics. We have compared every method of wrapping and vulcanizing.

They have been compared on tire testing machines, where four tires at a time are constantly worn out under all sorts of road conditions.

Thus we also compare all rival tires with our own.

The result is a tire which comes close to finality.

When this tire is made oversize—made so it can't rim-cut—it means the utmost in pneumatic tires.

Some 400,000 tire buyers have proved this. No-Rim-Cut tires have thus become the most popular tires in existence.

Our 1912 Tire Book, based on all our experience is filled with facts you should know. Ask us to mail it to you.

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Branches and Agencies in 103 Principal Cities We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits

Main Canadian Office, Toronto, Ont. Canadian Factory, Bowmanville, Ont.

(566)

GOODYEAR NO-RIM-CUT.

The clincher covers had two thick rubber bottom edges which were fitted by pressure into a rim with hook-shaped side edges facing inwards. The cover's thickness reduced space for the inner tube which, moreover, needed the right pressure to avoid overstraining the cover yet forcing the profiles to produce cuts on the sides [rim-cut]. Goodyear's new pneumatic tires based their greater air capacity on the way they were attached to the straight-side rim type. The two bottom edges of the cover contained hidden within them a tensioning cable that fixed them to the rim. It had metallic profiles on both sides to prevent the cover from becoming displaced laterally.

Tires That Are Oversize

Goodyear Detachable Auto Tires are always oversize. If you would have tires that positively will not Rim, Cut or Creep, see that you get

GOODYEAR Detachable Auto Tires

They give extreme mileage, are supreme in resiliency and are easily removed and replaced in case of need. Send for a free copy of "How to select an Auto-Tire."

Goodyear Tire & Rubber Company
Main Office and Factory: Freedom St., Akron, Ohio
BRANCHES AND AGENCIES IN ALL CITIES.

24. Advertisement in *Automobile Topics,* April 6, 1912.
25. Advertisement in *The Automobile,* July 28, 1910.

A FEW INCHES.
BF Goodrich was one of the first firms to offer the U.S. market fabric technology and oversized tires to fit standard rim dimensions.
Their Three-Seventy-Five model was especially intended for users of the best seller, the Ford T.

26. Modular advertisement in the newspaper *The Coconino Sun* (Flagstaff, Arizona), April 20, 1917.
27. Modular advertisement published in *The Logan Republican* newspaper, May 19, 1917

A MATTER OF SIZE.
General Tire & Rubber Jumbo tires offered a larger pneumatic tire for the same original rim size, with the corresponding increase in air cushioning, which enhanced their shock-absorbing capacity and greater comfort in driving. Of course, the issue of size was the main selling point and this resulted in the selection of an elephant as a metaphor for the concept. The name Jumbo had become a generic name for these giant animals, an inheritance from the enormous African specimen that, since its incorporation in the Barnum & Bailey Circus in 1882, turned into an emblem for their posters, advertising the attractions offered during the circus's tours and functions.

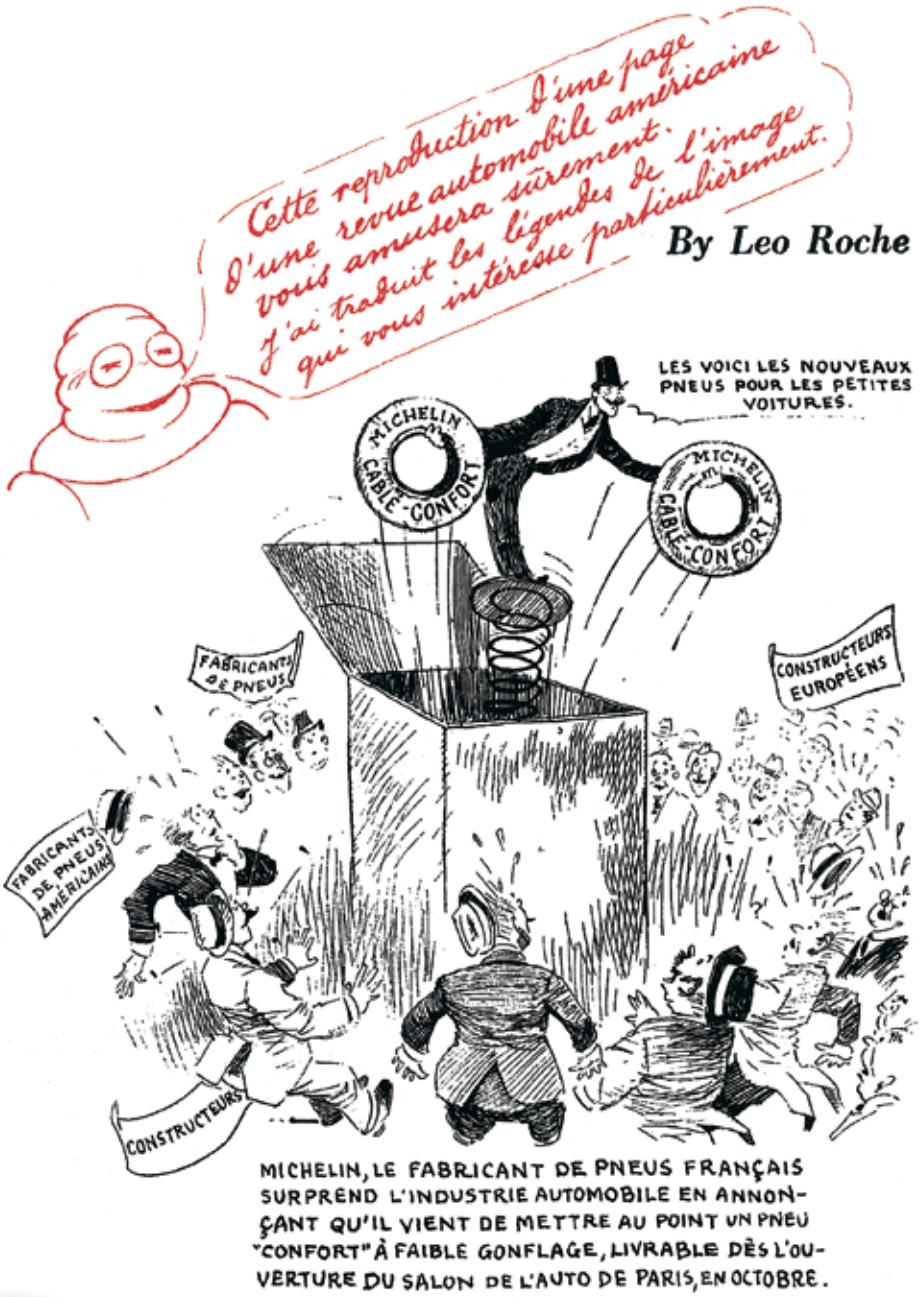
28. Color insert in *Motor Age* magazine October 11, 1917.
29. Advertisement in *The Saturday Evening Post* magazine, 1918.

MAKING A CLAIM. The image above shows a 1924 advertisement for the firm General where they assert that they were the initiators of low pressure technology, which had already been converted at that time into an industry standard. The line drawing applied to the profile of the automobile makes the pneumatic tires stand out, the latter being highlighted with stronger graphics by applying fill and shadows. The slender woman and the thin Borzoi hounds are clear references to both the social status and the lightness of the balloon tires and their extra provision of air.

30. Advertisement published in *The World's Work Advertiser* magazine, 1924.

PUTTING ON AIRS.
The incorporation of the new low pressure technology became a powerful selling point for the most luxurious and expensive models of the principal automobile companies which were always equipped with the latest innovations in the market. For these cars, which were heavy in size, the cushioning of the large balloon pneumatic tires meant a more comfortable ride for the passengers.

31. Advertisement for the five passenger Sixes Sedan model of the Reo Motor Company, 1924.
32. Advertisement for the Hudson Super-Six and Essex Six models of the firm Hudson and Essex, 1924.



Michelin to Market Cord Balloon Tires

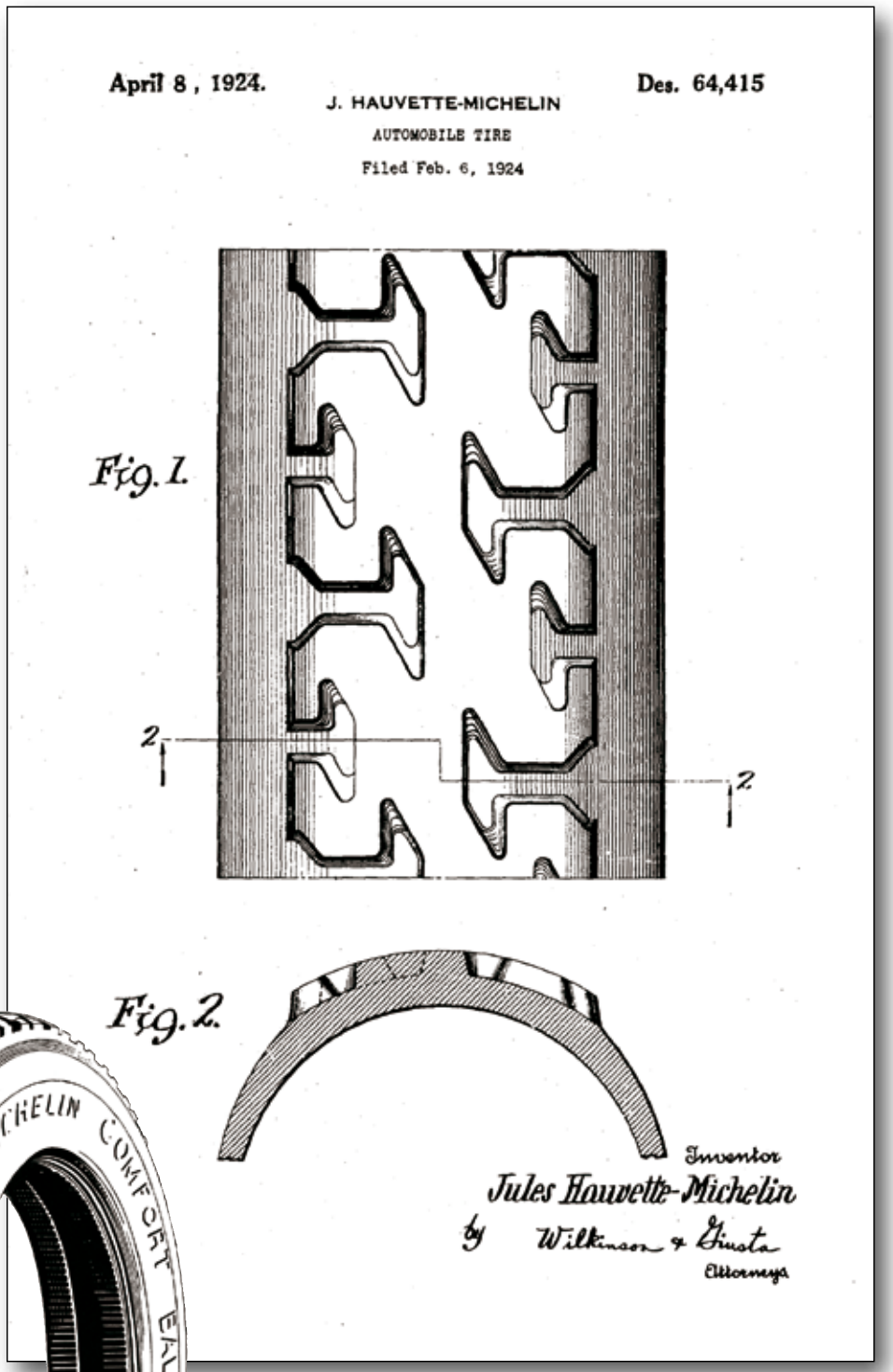
Surprises Industry in Europe by Announcing Perfection of New Product

PARIS, Aug. 16. (*by mail*)—Michelin will place low-pressure balloon tires on the market at the opening on the Paris automobile show in October. The French tire maker's activities in this direction had been kept a profound secret until this week, when he presented to the leading automobile manufacturers a perfected ... of "comfort ...

PANDORA'S BOX.

The American press echoed the announcement made by Michelin in August 1923 to present their low pressure tires at the XVIII Exposition International de l'Automobile de Paris in October - popularly known as the Salon de l'Auto.
This action caught most of their competitors on both sides of the Atlantic by surprise. Above, the French advertisement headlined by Bibendum reproduces a humorous vignette —originally published in English in the American magazine *Motor World*—that recreates this surprise, demonstrating the impact it had on the sector.
The drawing was signed by Leo Joseph Roche (1888-1954), illlustrator specialized in vignettes and humorous cartoons about social and political life in newspapers and magazines.

33. Michelin pamphlet reproducing the vignette published in *Motor World* magazine, September 12, 1923.
34. News published in the magazine of the motor industry *Automotive Industries,* August 30, 1923.



April 8, 1924. Des. 64,415

J. HAUVETTE-MICHELIN

AUTOMOBILE TIRE

Filed Feb. 6, 1924

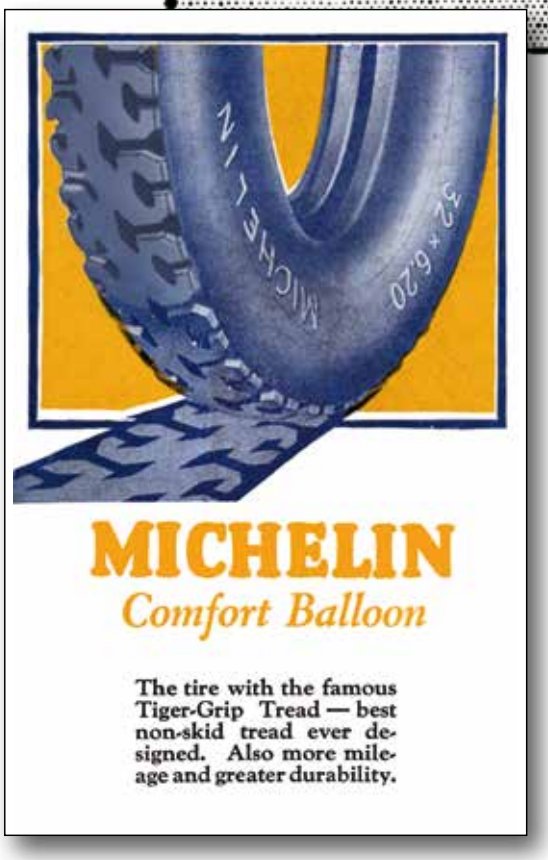
Fig. 1.

Fig. 2.

Inventor
Jules Hauvette-Michelin
by Wilkinson & Giusta
Attorneys

C-TREAD. The above image depicts the diagram of Michelin's Comfort Cord cover model in the patent applied for on February 6, 1924 by Jules Hauvette-Michelin and granted on April 8 of that same year. The tread pattern shows two parallel rows joined by a central line, each formed by the aligned repetition of a module resembling the letter 'C'. Could it be that this double C made reference to the two initials contained in the name of the model Comfort Cord?

35. First illustrated page of the two comprising the American patent number 64,415 by Michelin, 1924.
36. The Comfort Cord pneumatic tire, detail of an advertisement in press, 1924.



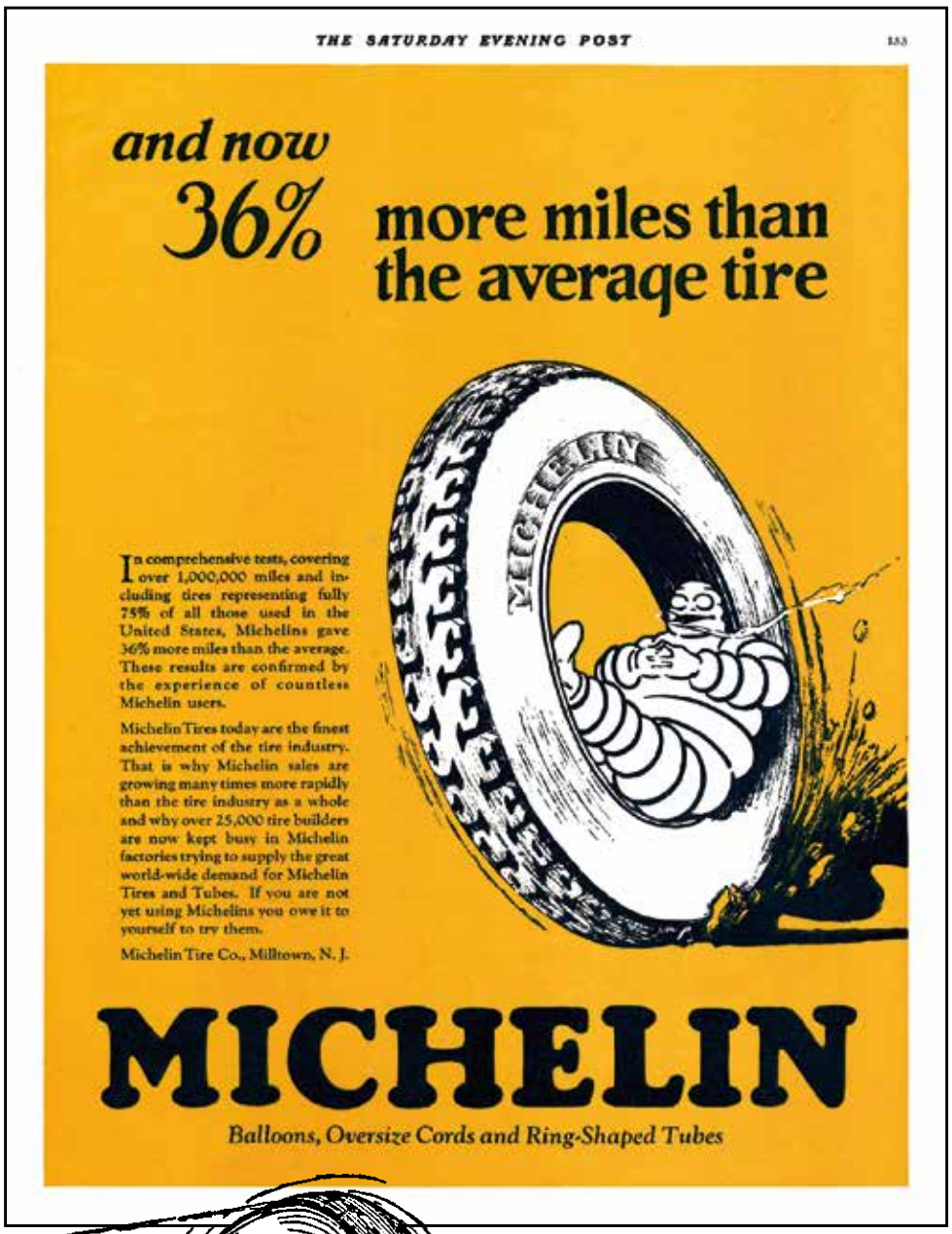
RIDING ON A TIGER.
The rubber non-skid tread of Michelin's new American balloon pneumatic tire, the Comfort Cord, was named Tiger-Grip, referring to the gripping quality of tiger claws. Feline representation had previously been widely employed by other tire companies, such as the Midgley Tire & Rubber Co. from Lancaster, Ohio, with their tiger image advertisements and slogan "The tire with a thousand claws" since 1914, or by the Defiance Auto Tire Co. and their Tiger Tread tire in 1915. The vignette shown above is part of an extensive press campaign developed during 1924, with illustrations by Arthur Norman Edrop.

37. Michelin Modular Advertisement published in *The Record-Argus* (Greenville, Pennsylvania), August 13, 1926.
38. Promotional card for the Michelin Comfort Cord, 1924.


STOP
983·249
NY 1924

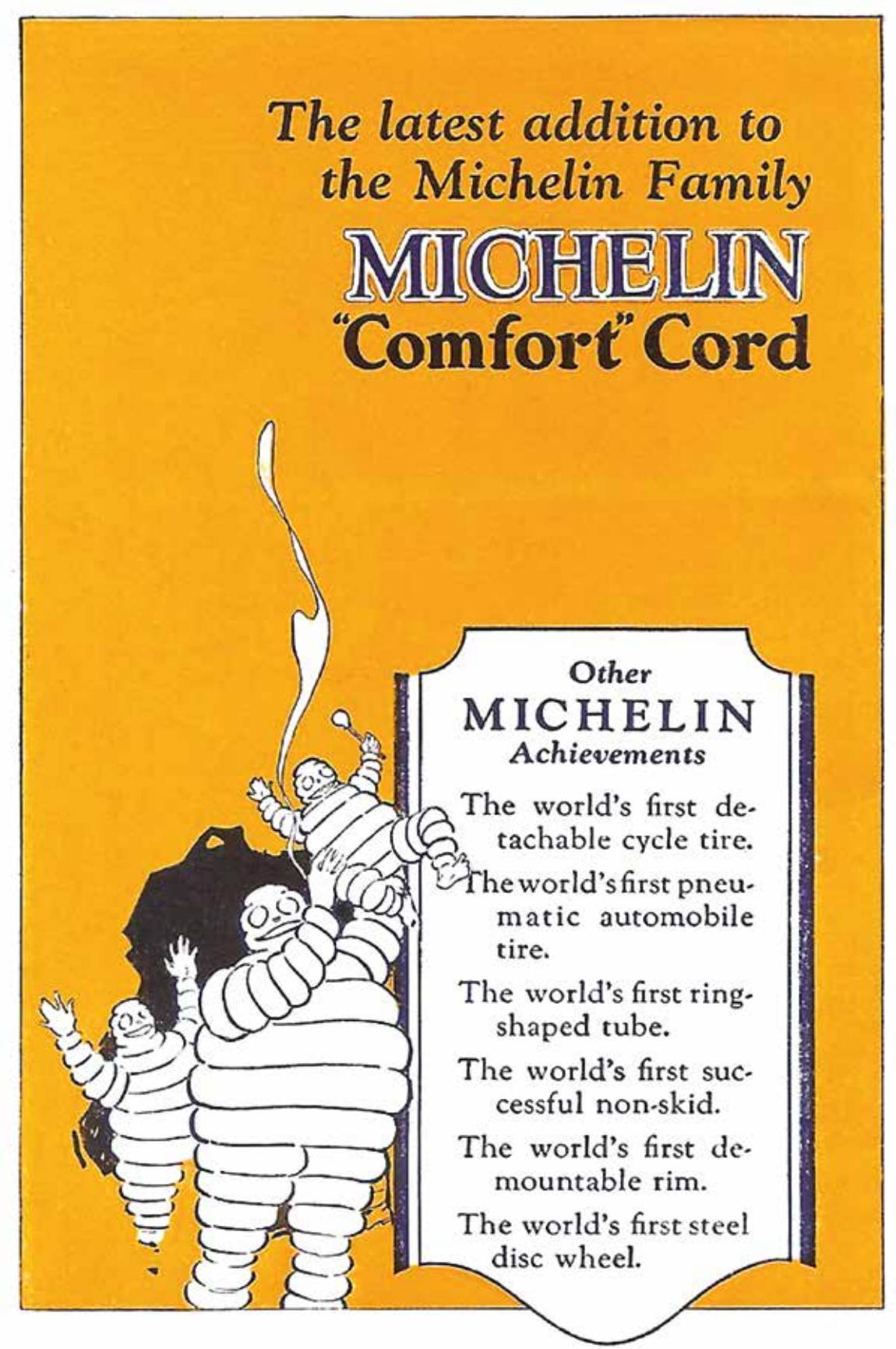
ELECTIONS ON WHEELS.
The Republican candidate Calvin Coolidge, President of the United States, poses next to an automobile, a Buick Sedan, equipped with a radio system—hence the taut cables at the rear of the vehicle and the speaker attached to the ledge—used in the election campaign of the 1924 presidential elections. The car was equipped with Michelin's Tiger Grip tread tires.

39. Photograph taken on August 14, 1924, National Photo Co.



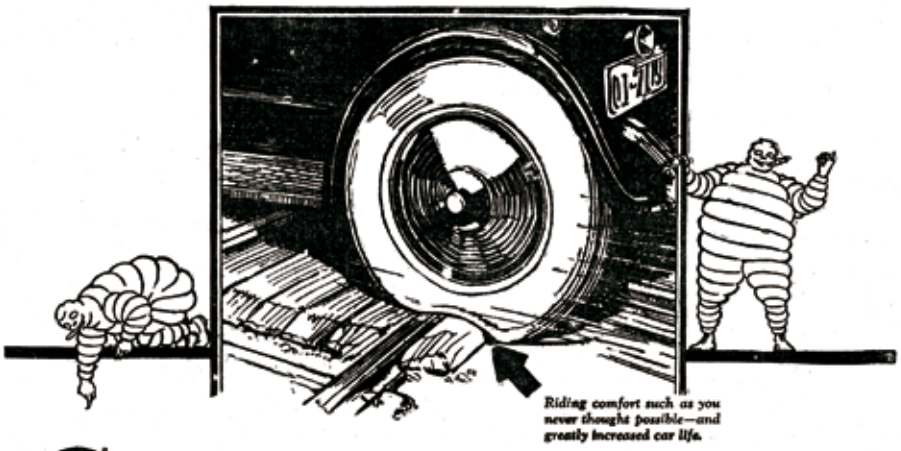
ON DIFFERENT TREADS.
The design of the Tiger-Grip tread pattern for Comfort-Cord tires manufactured at Milltown was exclusively used in the American market. In the French and Italian Michelin factories, the design used on the new Câblé Comfort low pressure pneumatic tire was the same as that used in the previous model, the Michelin Câblé, with the characteristic repetition of the initial 'N.' This is shown in the comparison of the two illustrations presented on this page.

40. Michelin advertisement published in the U.S. magazine *The Saturday Evening Post*, April 24, 1926.
41. French promotional vignette for the Câblé Comfort tire, c. 1926.



THE FAMILY EXPANDS. The above image shows a brochure from the promotional launch of the new Comfort Cord tires, utilizing the metaphor of the birth of a new member in the Michelin family of products. The family setting and the presence of offspring constitute an unusual image in the portrayal of the character.

42. Interior illustration of a Michelin promotional brochure, c. December 1923-January 1924.



Come and enjoy
the new experience of riding on *Balloon Type*
MICHELIN
Comfort Cords

These tires are twice as big as ordinary cords but inflated to less than half the pressure—that is the secret of their comfort. They fit present rims, last longer than ordinary tires and cost hardly any more.

Your first ride on these remarkable new tires will change your conception of motoring. Holes and obstructions simply disappear. Rough roads become boulevards.

Tests covering hundreds of thousands of miles indicate that the life of the car will be increased as much as 50%. Yet these tires cost hardly any more than ordinary cords.

Words about these new tires necessarily seem extravagant. You must *ride* on them to appreciate their revolutionary qualities.

Accordingly we are this week giving public demonstrations of the tire. From 9 A.M. to 6.30 P.M. daily, demonstrating cars will be at

Riverside Drive (lower level) foot of 79th Street, New York;
773 Atlantic Avenue, Brooklyn;
517 Frelinghuysen Avenue (Corner of Meeker Avenue), Newark.

If you will get from your tire dealer one of the Demonstration Cards with which we have provided him, we shall gladly take you for a ride at any of these points.

Soon everyone will be talking about these new tires. Will you be among the first actually *to ride on them?*

On the Same Car and Rim

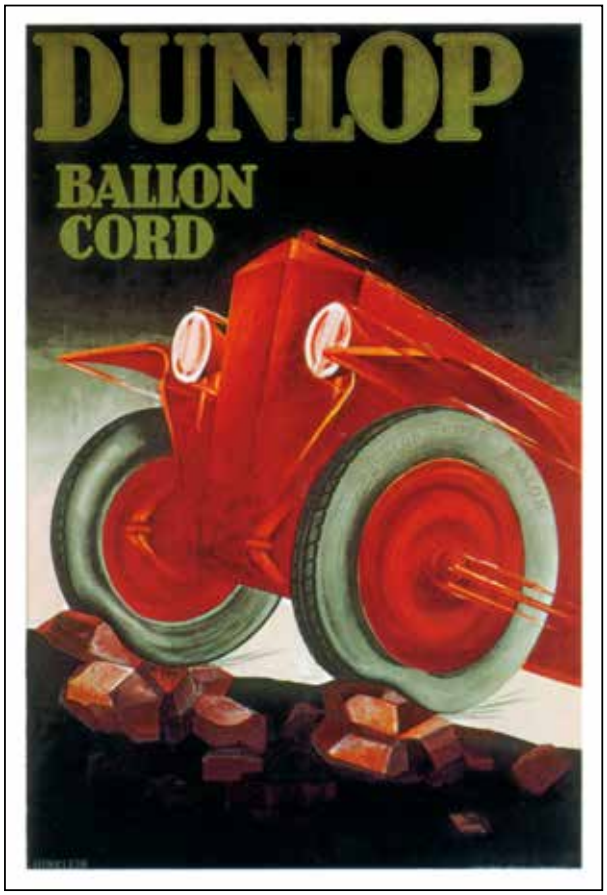
MICHELIN TIRE COMPANY
245 West 55th Street, New York — 330 Plane Street, Newark
Factory—Milltown, N. J.

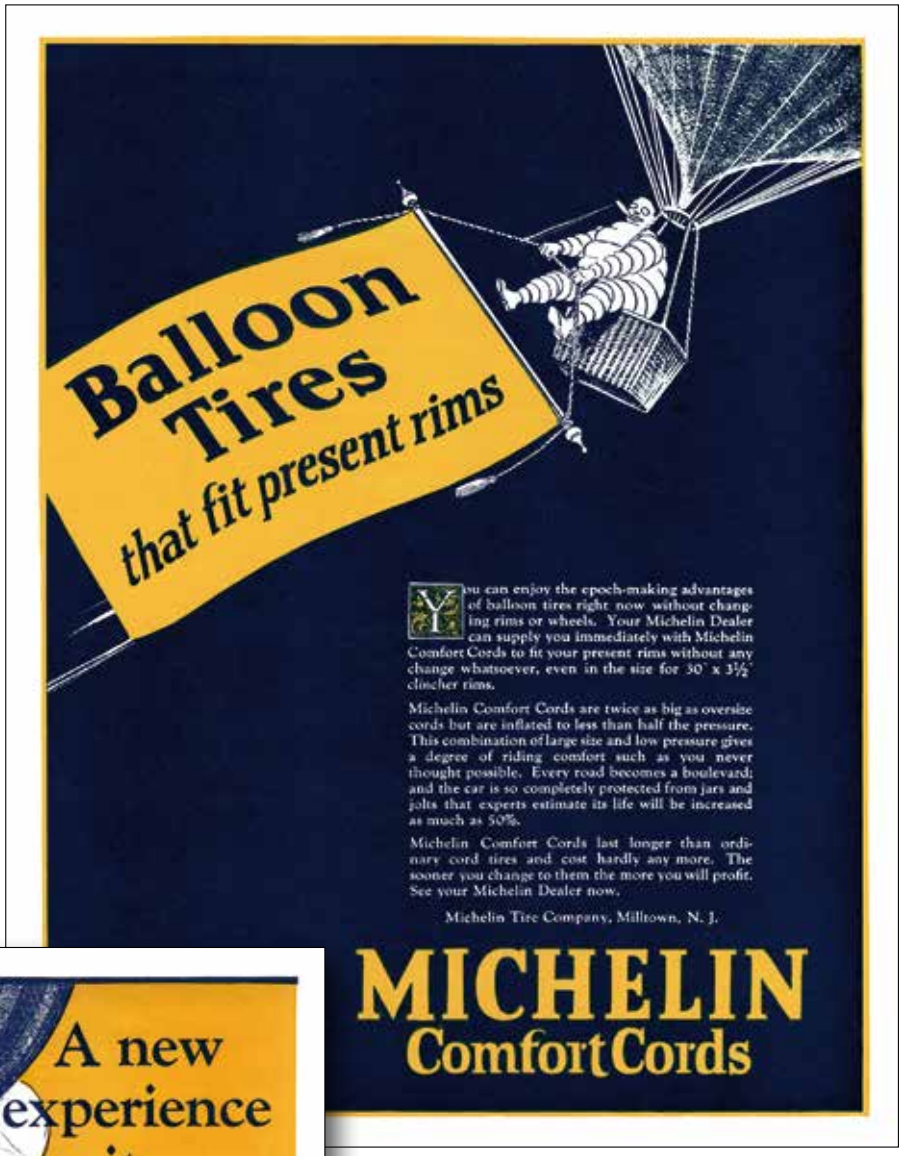
END OF YEAR, CAMPAIGN LAUNCH BEGINS. Although the massive launch of the Michelin balloon pneumatic tires took place in early 1924, the first advertising insertions appeared in the press in December 1923, creating expectations about the new technology. These advertisements invited readers to participate in driving demonstrations as passengers, on board vehicles fitted with the new Michelin Comfort Cords.

43. One of the first advertisements, published in *The New York Herald,* December 4, 1923.

COMFORT. The low inflation pressures of balloon tires gave them better shock-absorption capacity against obstacles. This quality was graphically translated in the representation of their absorbing behavior when coming across bumps and uneven surfaces, an image that was repeatedly utilized by several companies when promoting their products. The images above show similar advertisements for Michelin and Firestone. Below right, the top a springy pneumatic tire is adapted to serve as a seat for a lady. In a similar way, the tire also does so for the zone coming into contact with the ground, providing maximum comfort.

44. Michelin's advertisement in *The Gettysburg Times,* January 6, 1924. **45.** Advertisement for Firestone in *Country Life,* March 1924.
46. German poster for Dunlop's Balloon Cord, 1925. Illustrated by Franz Jacob Hinklein.
47. Poster for Belgian tires, Englebert's Chevron Cordé, 1925. Illustrated by the French artist Henry Le Monnier (1893-1978).





FOUR BIBENDUMS IN A HOT AIR BALLOON.
The term "balloon" applied to low pressure tires was literally portrayed as a graphic resource and visual metaphor in Michelin advertisements. In the example shown on the left, four Bibendums are depicted floating in the sky, tightening cords as there are four wheels in an automobile. The vehicle is hoisted so that the weight the tires bear is lightened and they roll along the road as if they were carrying a light load, resulting in a comfortable ride for the chauffeur and passengers.

48. Michelin's advertisement published in *The Saturday Evening Post,* April 5, 1924.
49. Advertisement in *Life* magazine, February 21, 1924.

EXTRA HELP. The advertising illustration shown above portrays the benefits provided by balloon Comfort Cord tires for a more comfortable ride, in this case with the new Tiger-grip tread. The scene depicts Bibendum [Michelin tire] riding on a balloon [balloon technology] and carrying a large pneumatic tire on which cars circulate [the advantages for vehicles of "padded" and "weightless" driving thanks to the contribution of a greater volume of air].

50. Michelin advertising card, 1924.

BIRD'S EYE VIEW.
Winged elements like angels or birds moving in the air also served as visual metaphors to convey the feeling of weightlessness and comfort characteristic of low pressure tires. This can be seen in the advertising module for Michelin, on the right, showing Bibendum riding an eagle or in the illustration of a winged car, below, promoting the tires for the Lee brand.

51. Michelin's advertisement published in *The Morning Herald,* (Uniontown, Pennsylvania), March 21, 1924.
52. Detail of corporate letterheads for Lee tire distributors, letterhead dated July 1925.

FLOATING WITH HEWITT.
The 1924 Hewitt balloon Cord tire campaign resorted to air-born metaphors to advertise their low pressure models. The Hewitt Rubber Company from Buffalo, New York, was founded in December 1904 by Herbert Hills Hewitt (1855-1923). They produced rubber parts, tubes and other products derived from rubber for railway mechanics, and in 1917 began manufacturing tires. By 1920, John Fullerton Palmer, the inventor of Cord technology, worked as a consultant engineer at Hewitt.

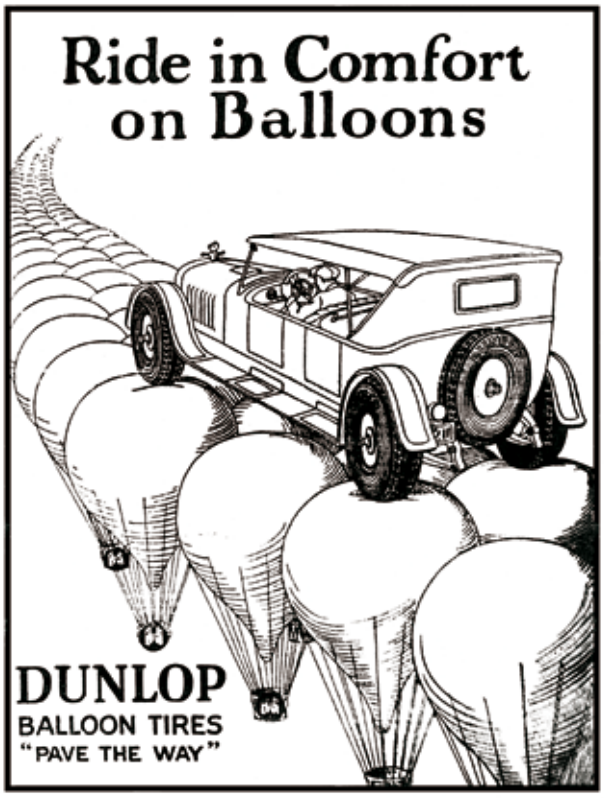
53. Advertisement in *Motor* magazine, January 1924.
54. John F. Palmer next to a car fitted with Hewitt balloon Cord tires, in a promotional pamphlet for Hewitt, c. 1924.

FLOATING ON AIR. The balloon model, by applying greater diameters and being inflated with low pressures, comprised a revolutionary technology that marked the way forward for the development of the tire. Publicity focused on translating the new technological concept into suggestive aerial images, as shown in the French poster above.

55. Poster for the French Souple Corde Balloon tires manufactured by Goodrich, c. 1925. Art by Stephen (?).

WEIGHTLESSNESS.
The image of the hot air balloon suspended in air—an obvious and direct metaphor of the product and its properties—was utilized in different advertisements by numerous tire companies, as shown in the examples on this page. To the left, a press advertisement that is very similar to the poster on the previous page, within the same advertising campaign. Further down, on the left, Dunlop's Canadian advertisement shows a roadway, paved not with cobblestones but rather with downy, padded hot air balloons. Below right, the Argentinean advertisement for Goodyear Air or Airwheel pneumatic tires, following the evolution of the same technological principle, recovered the recurring metaphor of the balloon in their 1933 publicity.

56. Advertisement for Goodrich's French Souple Corde Balloon tires, published in the magazine *L'Illustration,* 1925.
57. Advertisement for Dunlop balloon tires in the Canadian newspaper *Toronto Globe,* May 12, 1925.
58. Argentine press release for Goodyear Airwheel tires, 1933.



FLOATING ON A CLOUD.
In the two examples shown on this page the rival companies Fisk—featuring their pajama-clad child mascot—and Michelin—with the omnipresent Bibendum—employed similar appeals for advertising their low tires pressures in 1924 advertisements. Both ads are headed by similar slogans: "Like floating on a cloud" by Michelin, and "Like riding on the clouds" in Fisk's.

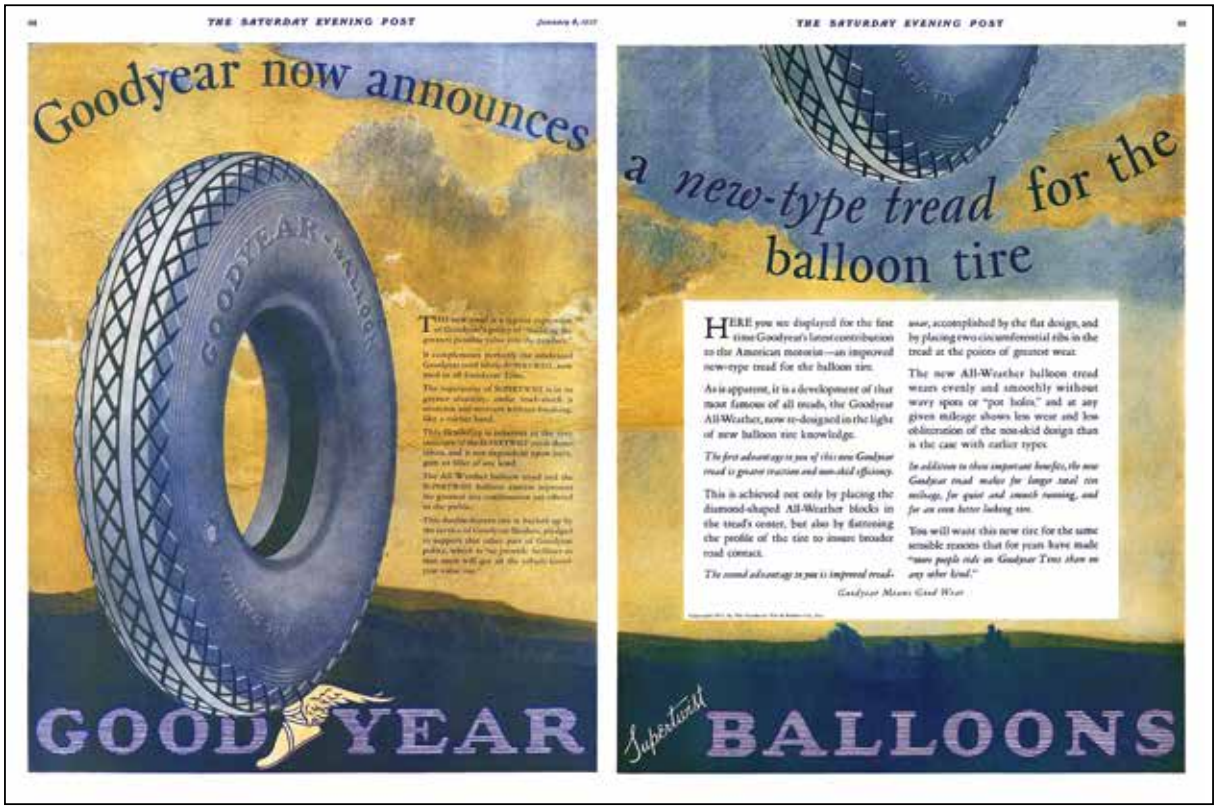
59. Michelin's advertisement in *The Saturday Evening Post,* March 22, 1924.
60. Advertisement for Fisk balloon tires in *The Literary Digest,* January 26, 1924.

AERIAL DRIVING.
Since the launch of balloon tires, an important part of the industry's effort was focused on perfecting the balance between a larger air cushion and low inflation pressures. In the late 1940s several companies offered their own versions, such as Fisk with their Airborne tires or United States Rubber Company with their U.S. Royal Air Ride. The latter was developed for the exclusive consumer and featured characteristic white sidewalls—generically called whitewall tires—so fashionable in those years.According to the advertising texts, the U.S. Royal Air Ride contributed up to 14% more air volume than conventional pneumatic tires. The illustrations of the Air Ride campaign are signed by New York artist Arthur Saron Sarnoff (1912-2000).

61. Advertisement in *Life* magazine, August 18, 1947.
62. Advertisement in *Life* magazine, January 27, 1947.

CONSTANT CLOUDS. On this page we see two examples of advertisements printed two years apart in the same publication. Both were double page ads and utilized similar resources for an equivalent product line: the balloon tire. The advertisement for Michelin features the new Tiger-grip tread, while Goodyear presents the adaptation to this type of cover for their well-known All-Weather tread with a modular design forming a diamond or rhombus shape reinforced with two ribs.

63. Michelin's double-page advertisement in *The Saturday Evening Post,* May 30, 1925.
64. Goodyear's double-page advertisement in *The Saturday Evening Post,* January 8, 1927.

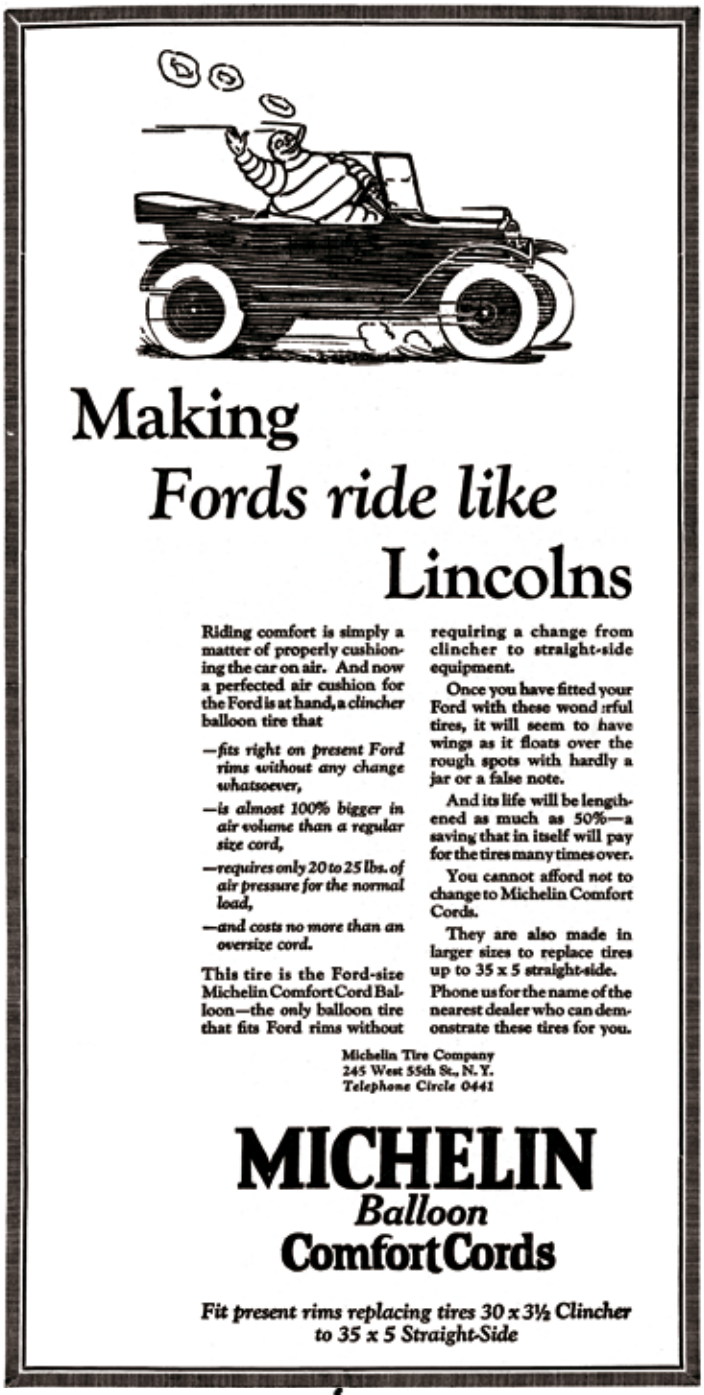


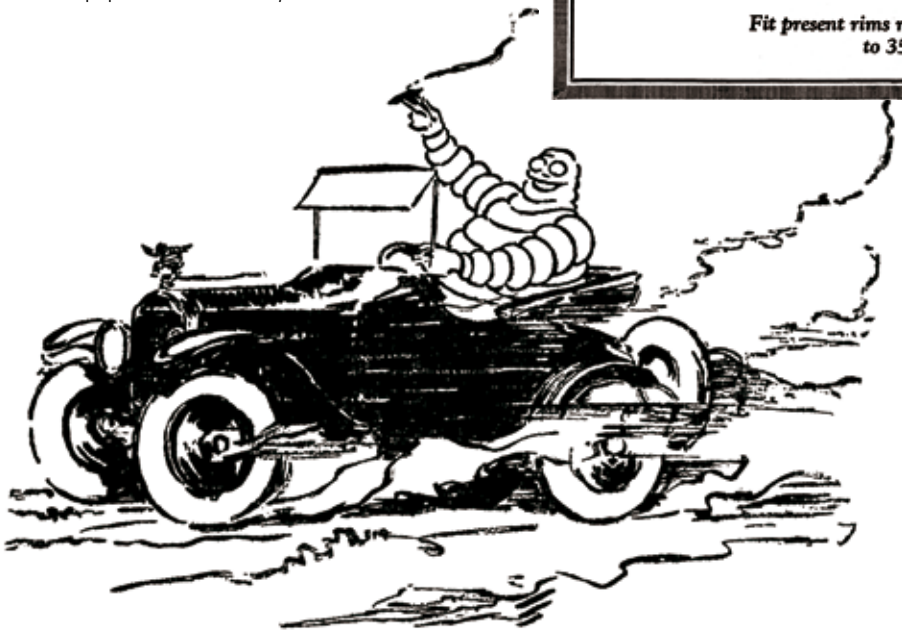
OVERSHADOWED. United States Rubber employed striking illustrations of aerial imagery, in which Royal Cord Balloon tires became huge clouds that, shifting in space and time as the seasons passed, cast their shadow over different urban landscapes.

65-70. Advertisement published in *Country Life* magazine between 1925 and 1926.

LIGHTWEIGHT VEHICLES.
One of the main objectives for Michelin's Comfort Cord advertising was to recruit customers of lightweight vehicles such as those produced by Ford, a market segment highly sought after by companies in the sector. Different firms offered balloon tires for the utilitarian Ford, but they needed a series of modifications to conveniently fit the clincher rims that standard manufacturers used. In contrast, Michelin developed a model that was 100% compatible.

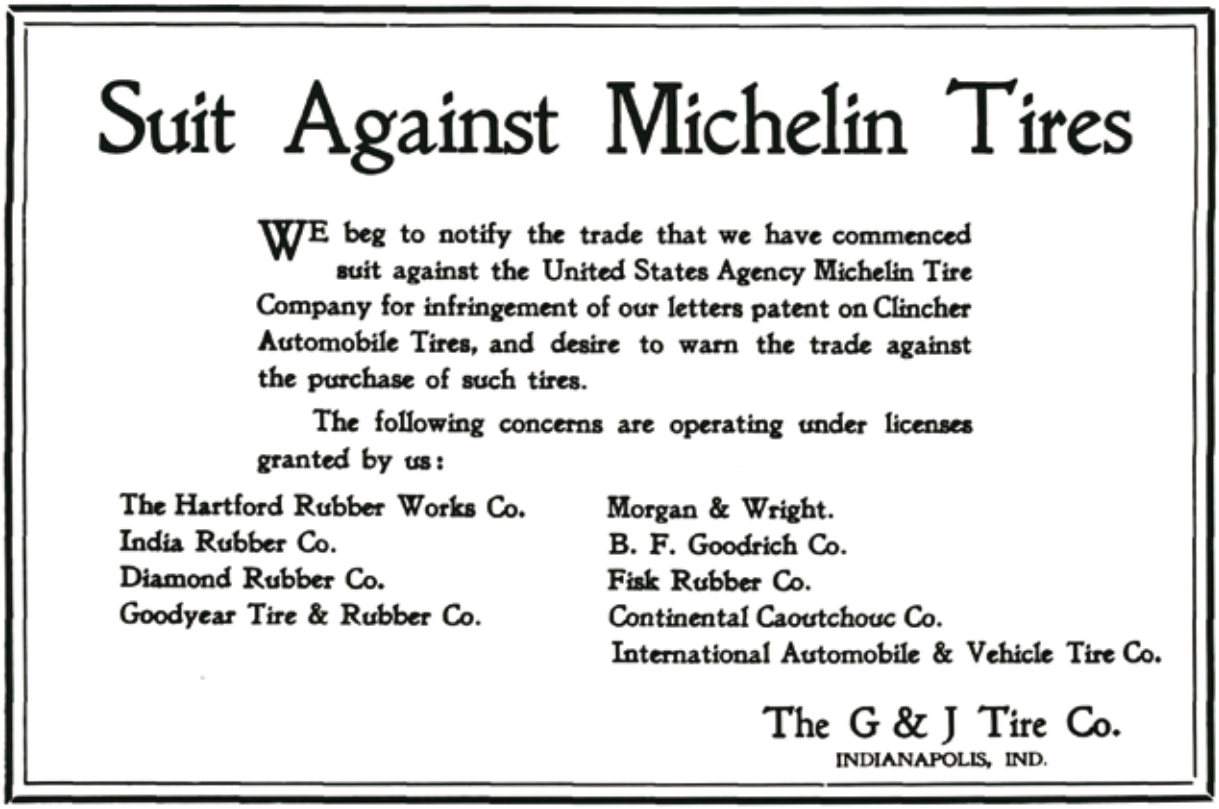
71. Bibendum in a hot air balloon. Detail of a modular advertisement published in *The New York Times,* March 10, 1924.
72. Michelin modular advertisement in *The New York Times,* March 31, 1924.
73. Detail of an advertisement published in the newspaper *San Antonio Express,* March 7, 1925.





COMFORT, WITH FORD. The image above shows Henry Ford photographed in 1921 next to a Ford T in Buffalo, New York. That same year, about one million units of this car were manufactured—whose production had begun in 1908—a number that doubled in 1925. Below, Bibendum poses next to a Ford T Ford Sedan from 1924, with Michelin Comfort tires.

74. Portrait of Henry Ford, photograph from 1924.
75. Michelin's French poster for the English-speaking export market (translated into several languages), 89 x 76 cm, 1925.



Suit Against Michelin Tires

WE beg to notify the trade that we have commenced suit against the United States Agency Michelin Tire Company for infringement of our letters patent on Clincher Automobile Tires, and desire to warn the trade against the purchase of such tires.

The following concerns are operating under licenses granted by us:

The Hartford Rubber Works Co.
India Rubber Co.
Diamond Rubber Co.
Goodyear Tire & Rubber Co.
Morgan & Wright.
B. F. Goodrich Co.
Fisk Rubber Co.
Continental Caoutchouc Co.
International Automobile & Vehicle Tire Co.

The G & J Tire Co.
INDIANAPOLIS, IND.

INFRINGING PATENTS.
The legal actions taken by G & J against those who marketed or manufactured clincher tires —whose patent they owned—also affected the general public. As a warning and chastisement for future offenders, the company inserted numerous advertisements in the press accusing Michelin, while taking parallel legal actions. The lawsuit against the United States Agency Michelin Tire Company, which started in October 1904 and extended until the end of the year, was restarted against the new agency, the Michelin Tire American Agency, in January of 1906 and remained activated during the following months. The suit resulted in more than twenty full page advertisements, in different advertising module formats, published in automotive press such as *Cycle and Automobile Trade Journal, Motor Age, The Horseles Age* and *The Automobile.*

76. Modular advertisement published in *The Automobile* magazine, December 31, 1904.
77. Full page advertisement published in *Motor Age* magazine, September 20, 1906.

To Sellers and Users
OF
CLINCHER TIRES

We have commenced and are vigorously prosecuting suits for infringement of our patents against the Pennsylvania Rubber Company and the Michelin Tire American Agency, Inc., on account of the sale of Clincher tires.

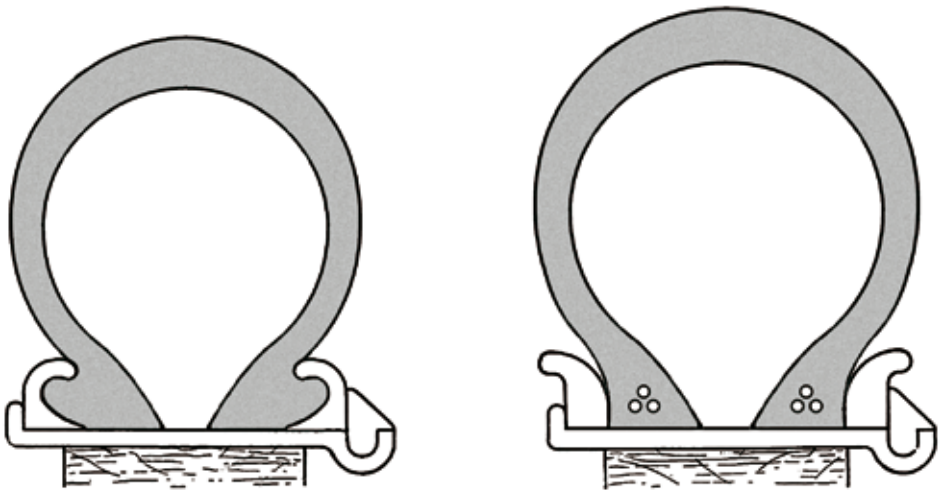
The sellers and users of infringing tires are equally liable with the manufacturers of such tires. Whatever rights we may have under our patents will be rigorously enforced. To escape liability, purchases should be made from one of the following named manufacturers, who are licensed to manufacture or sell under the G & J patents:

G & J Tire Co.
Hartford Rubber Works Co.
Morgan & Wright
B. F. Goodrich Co.
Diamond Rubber Co.
Goodyear Tire & Rubber Co.
Fisk Rubber Co.
International Automobile & Vehicle Tire Co.
Continental Caoutchouc Co.

G&J TIRE CO.
Indianapolis, Ind.

SETTING THE STANDARD. This page shows three examples of advertisements for Hartford tires, one in 1909 with clincher technology and two more, in 1910 and 1913, praising the virtues of straight side rim technology. It was precisely during this time period that the second option was definitively imposed on the American market. The image above right shows an advertisement for the company United States Tires—which had absorbed several pioneering tire firms such as G & J, Hartford, Morgan & Wright or the local subsidiary of the German Continental—, boasting about their straight-side technology, implanted under license from Dunlop and standardized on their tires. On the left, a Goodyear advertisement graphically confronts and compares using technical arguments the two market options: on the left, clincher covers and on the right, straight side covers.

78. Advertisement for Hartford Tires published in the magazine *Cycle and Automobile Trade Journal,* January 1, 1909.
79. Advertisement for United States Tires published in the Californian newspaper *The San Francisco Call,* January 29, 1913.
80. Goodyear's advertisement published in *The Automobile* magazine, June 9, 1910.

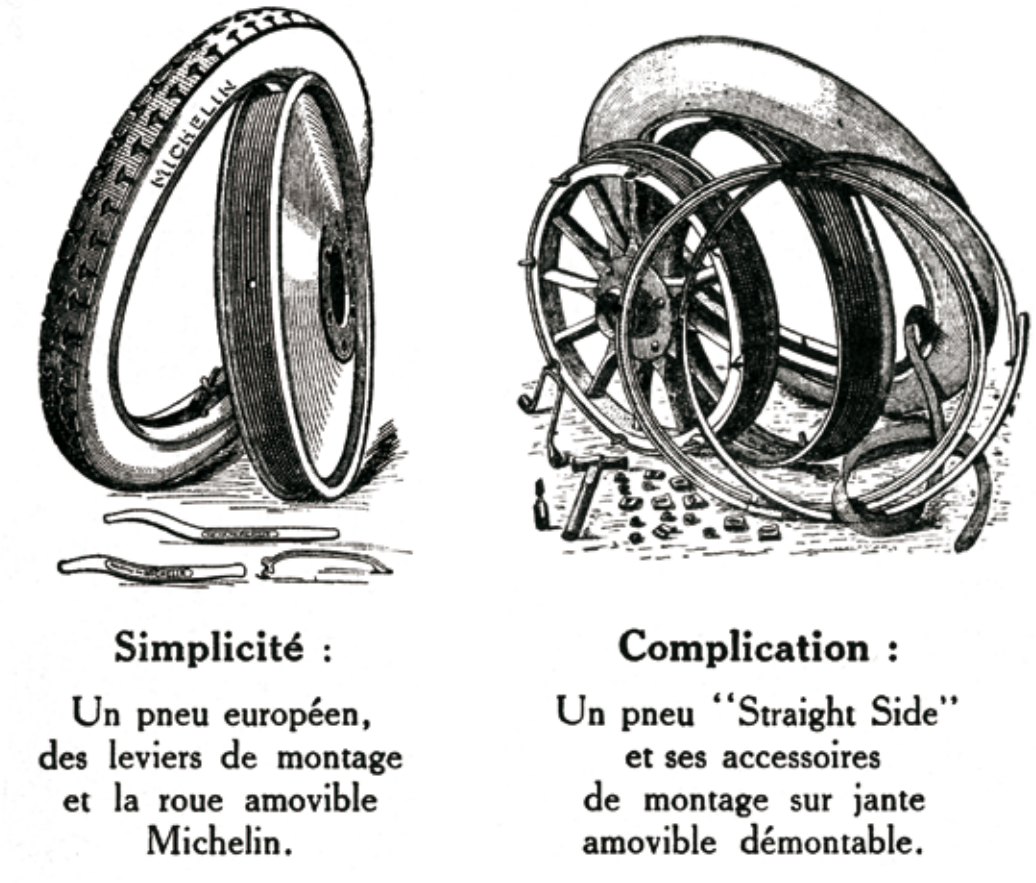


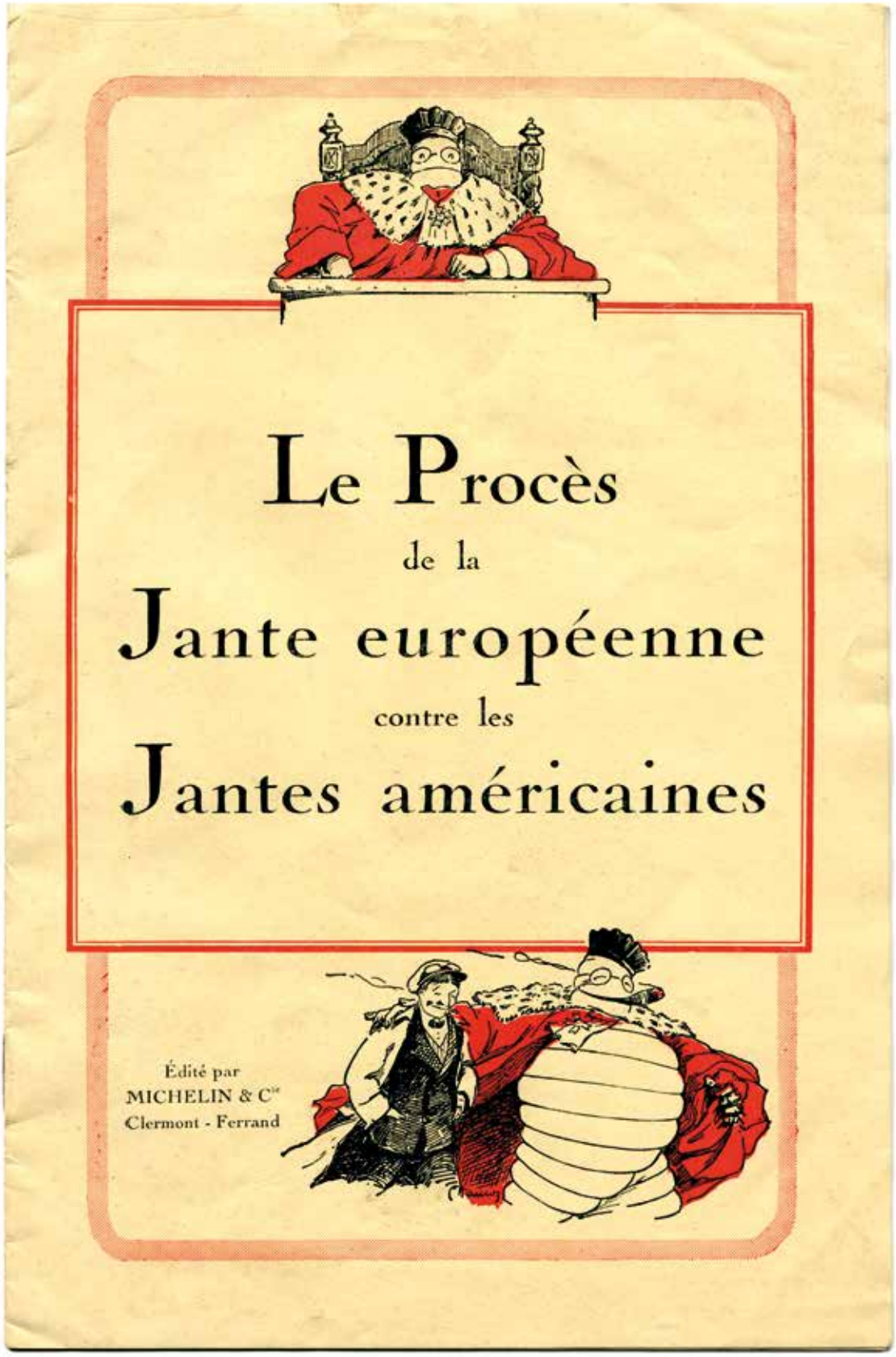
FIRESTONE SAFETY UNIVERSAL RIM.
[Adapted to any detachable clincher tire.]

FIRESTONE SAFETY UNIVERSAL RIM.
[Adapted for any quick detachable tire.]

FIXING THE TIRE. The image above shows Firestone's Safety Universal Rim and its adaptability to both types of pneumatic tires. To the left, the cross-section of a clincher cover with its characteristic hook-shaped edges fastened on each side by a contour ring curved towards the inside, and fixed under pressure after the inflation of the inner air chamber. On the right, a straight-side tire cover with straight-walled edges which house three internal cables that run along the entire length of the tire's inner circumference and which, when tensioned, fit between two curved contour rings that prevent its lateral displacement. Below, Michelin's comparison between their detachable steel disc wheel technology and that of the complicated detachable rims, with their fitting rings, clamping mechanisms and necessary tools ... quite an ordeal, if not torture for the unfortunate motorist who suffered a flat tire.

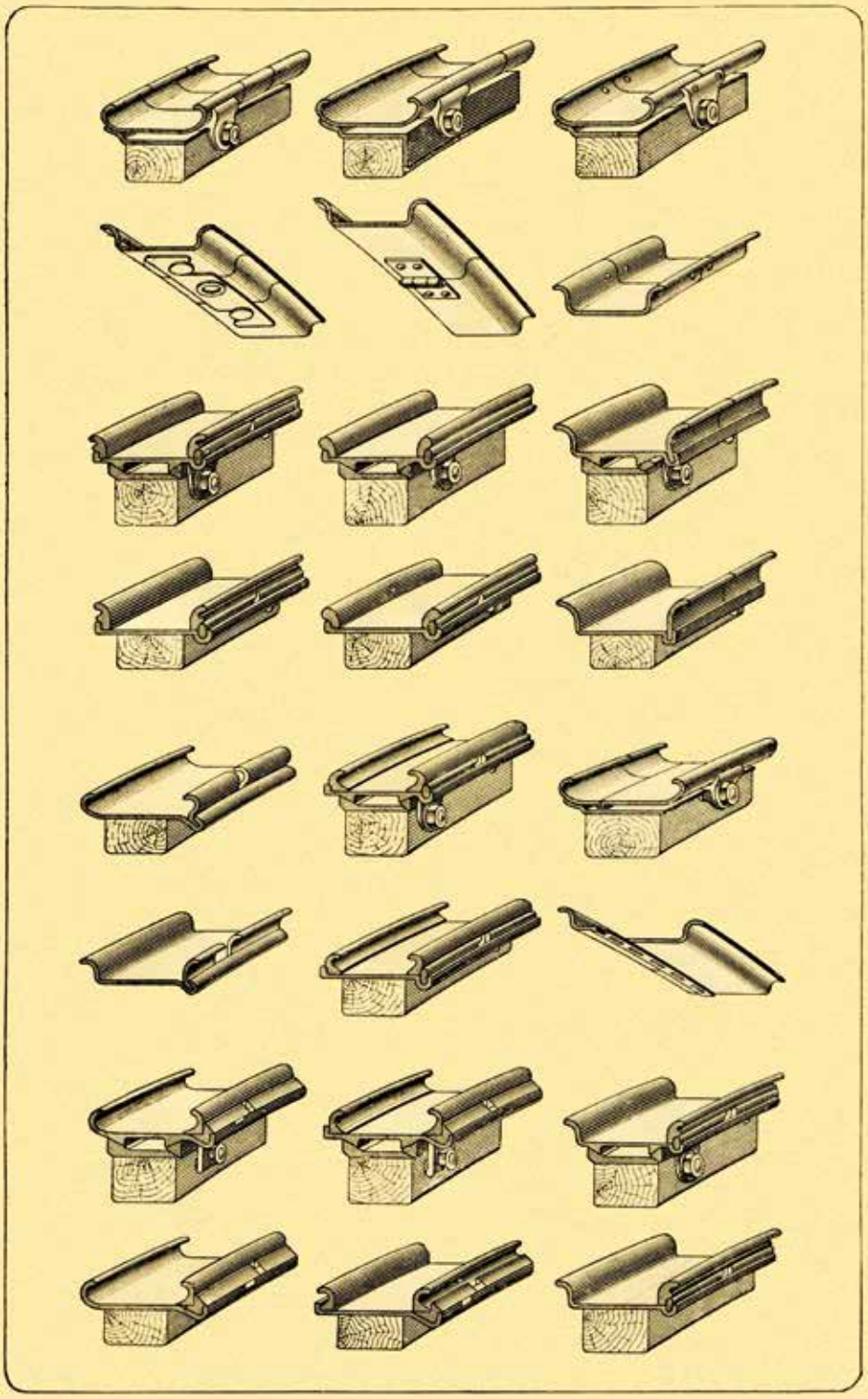
81. Technical drawings of Firestone rims suitable for clincher and straight side covers, extracted from a motor world publication, 1907.
82. Details of the illustrations from a long horizontal banner advertisement running across the top of a page, number 98 of the series "Le samedi de Michelin," published in the French magazine *L'Illustration,* March 19, 1921.





AN IMPARTIAL JUDGE? In the illustration that is featured on the cover of the booklet—realized by Georges Hautot—Bibendum stands as judge [and part] of the process which, as the vignette shows us here, has the task of safeguarding the interests of the motorist [as well as those of the company for which he is also the ambassador].

83. *Le procès de la jante européenne contre les jantes américaines,* booklet published by Michelin in 1921.



Ces quelques types de jantes américaines montrent l'incertitude
où se débattent les fabricants engagés dans la voie du " Straight Side ".

84. Inside page of the booklet *Le procès de la jante européenne contre les jantes américaines*, published by Michelin in 1921.

19 Mars 1921 — L'ILLUSTRATION — N° 4072

LE 98e SAMEDI DE MICHELIN

Trans...atlantide

Simplicité :

Un pneu européen, des leviers de montage et la roue amovible Michelin.

Il suffisait, jadis, qu'une idée nous vînt de l'Étranger pour que nous l'admirions et l'adoptions sans contrôle, et l'on a pu écrire, avant la guerre : « Les Français sont aujourd'hui le seul peuple du monde qui ne se croit plus le premier. »

Y avait-il quelque chose de changé en France ? Voici une idée américaine à laquelle nous n'applaudissons pas. C'est peut-être que nous la connaissons trop. Je veux parler du « Straight Side ».

La floraison des voitures américaines surgissant avec la guerre vous a peut-être permis de remarquer une différence fondamentale entre les modes d'attache, sur la roue, des pneus en faveur des deux côtés de l'Atlantique.

Alors que le pneu européen a des bourrelets souples passant aisément par-dessus les crochets fixes de la jante, le pneu américain dit « Straight Side » a des rebords rigides, garnis de câbles d'acier, qui, par conséquent, ne peuvent passer par-dessus les rebords de la jante, ce qui oblige à des types de jantes démontables et à des méthodes de montage également compliqués.

Pour avoir fait fi de la souplesse du caoutchouc, les Américains ont dû recourir à des procédés mécaniques qui, en Europe, ont été rejetés dès les premières années de l'industrie du pneu.

Je connais bien le « Straight Side », puisque la Michelin Tire Cº d'Amérique en fabrique journellement des milliers. C'est donc en parfaite connaissance de cause et en parfaite impartialité que je vous dis : « Le « Straight Side » n'est pas un progrès, loin de là, et le pneu européen n'a pas à lui céder la route. »

Je peux vous le prouver, mais je ne saurais, dans ces causeries, aborder une telle démonstration. Vous pourrez vous reporter aux études très documentées que lui ont consacrées MM. Baudry de Saunier dans Omnia *(mai 1920), C. Faroux dans* « La Vie Automobile » *(25 décembre 1920) et Morimer-Megret dans la* « Pratique Automobile » *(15 janvier 1921), ou bien me demander ma brochure :* « Le procès de la jante européenne contre les jantes américaines » (1).

Il est bien entendu que ma critique sur le « Straight Side » porte sur son mode d'attache. La qualité du pneu en tant que pneu n'a rien à y voir et n'est pas en cause ; elle veut ce que veut le fabricant, et, à ce point de vue non plus, nos confrères d'Amérique n'ont rien à nous apprendre.

Berendum.

(1) Mon adresse ? Clermont-Ferrand.

Complication :

Un pneu "Straight Side" et ses accessoires de montage sur jante amovible démontable.

26 Mars 1921 — L'ILLUSTRATION — N° 4073

LE 99e SAMEDI DE MICHELIN

Trans... atlantide

(Suite.)

Le type de pneu américain dit « Straight Side », vous ai-je dit Samedi dernier, n'est pas un progrès, loin de là ; et le pneu européen n'a pas à lui céder la route.

Mais, me direz-vous, des milliers d'Américains le préfèrent... En êtes-vous bien sûr ?

Constatons d'abord que 60 % des chauffeurs d'outre-mer roulent sur pneus à bourrelets souples, analogues à notre 90 (voyez plutôt la raison du plus... Ford).

Parmi ceux-ci, vous trouverez tous les fermiers qui, vivant et roulant loin de tout mécanicien, tiennent à n'avoir aucun ennui avec leurs pneus.

Les autres emploient, à la vérité, le « Straight Side », mais tout simplement parce qu'ils n'ont pas le choix, car les fabricants américains ont tous, suivant une expression bien anglaise, standardisé leur production en « Straight Side ».

L'Américain préfère donc le « Straight Side »... comme il préfère l'eau pure, depuis que le régime sec lui a fait passer le goût du vin ; on ne lui donne pas autre chose.

Cependant, une considération de mœurs américaines nous fait comprendre pourquoi l'Américain ne souffre pas des imperfections qui nous rendraient le « Straight Side » insupportable.

Dans « Omnia » *(mai 1920), M. Baudry de Saunier l'a expliqué très justement.*

« L'Américain, écrit-il, ne met jamais la main à d'autres organes du châssis que le volant de direction et les freins. Il demande à son automobile de le transporter, et dans le plus de confort possible. C'est tout. S'il a une panne, neuf fois sur dix, il n'intervient pas pour en avoir la solution : il met la voiture dans un garage, et c'est un réparateur de métier qui se charge de la suite. »

Pourquoi cet Américain a-t-il pris de semblables habitudes ? Parce qu'il a très peu d'occasions de faire « de la route » et qu'il roule surtout dans les agglomérations où la densité des réparateurs est telle qu'il en trouve toujours un sous sa main ou prêt à venir le dépanner, sur un coup de téléphone.

Quelque difficulté que j'aime présenter le changement d'un « Straight Side »... le conducteur américain s'en moque, il n'y met pas la main ! le spécialiste américain s'en moque : il a chez lui la machine-outil qu'il faut.

« Mais vous, tout seul sur la route ?... Aux prises depuis plus d'une heure, en pleine nuit (les deux ennemis étant parfois même réunis), avec un pneu qui se vit comme une enclume des coups de marteau de forgeron que vous lui assenez, qu'en sera votre martyre ? — car j'ai vu un de ces pneus cyniques, endurci dans la rouille, résister plus de 10 minutes, dans un garage américain, aux efforts combinés de trois gaillards spécialistes, qui s'efforçaient en même temps de m'en démontrer les charmes !...

Que pourrais-je ajouter à l'avis si autorisé de M. Baudry de Saunier ? Je me bornerai, dans mon prochain Samedi, à développer mes conclusions.

Berendum.

2 Avril 1921 — L'ILLUSTRATION — N° 4074

LE 100e SAMEDI DE MICHELIN

Trans... atlantide

(Fin.)

Pour peu que vous ayez lu mes deux Samedis précédents, vous savez en quelle estime (si j'ose dire) je tiens le type de pneu américain dit « Straight Side », et les jantes compliquées et les montages savants qu'il impose.

Les Américains, pour plusieurs motifs, dont le principal semble être le besoin de « faire autre chose », se sont obstinés avec une bizarre ténacité à fabriquer des pneus à rebords rigides, dits « Straight Side », tandis que nous restons fidèles aux pneus à bourrelets souples.

Il y a deux modes d'attache des pneus : l'américain et l'européen.

Quelqu'un s'est trompé ; j'ose affirmer que ce n'est pas nous.

Ne changeons donc point notre modèle qui a fait ses preuves.

Si vous achetez une voiture qui devra être importée d'Amérique, exigez qu'elle vous soit livrée sur des pneus du modèle dont vous avez l'habitude. On n'a jamais rien fait de mieux.

Et si vous avez acheté une voiture américaine munie de jantes « Straight Side », n'hésitez pas ; changez-les avant d'avoir éprouvé les mille et un ennuis que ma vieille expérience vous a fait entrevoir.

Vous pourrez profiter de l'occasion pour monter sur votre voiture des roues amovibles Michelin.

Soyez tranquilles, le cas est prévu, nous avons étudié et réalisé au mieux cette transformation qui s'entraînera pour vous aucune difficulté.

Nous avons en magasin, fabriqués d'avance en série pour les principaux types de voitures, les moyeux spéciaux sur lesquels se fixe la roue Michelin.

En quelques heures, à peu de frais, votre agent habituel les montera sur votre voiture.

Et vous aurez ainsi du même coup la jante adéquate au type de pneu généralement adopté en Europe et la meilleure roue amovible qui est en même temps — ce qui ne gâte rien, même par ces temps de baisse — la moins chère !

Berendum.

Six écrous, un vilebrequin, une broche, voilà tous les accessoires de montage de la roue Michelin.

TRANSATLANTIC BARRAGE. Michelin used all their advertising artillery to combat the inevitable: the establishment of straight side technology for detachable rims, which had already begun its continental invasion and would end up displacing the proposal of the steel disc wheel. The work of raising awareness among the French public was carried out through different advertising insertions—such as those shown here—that used critical texts and a contemptuous tone towards the attitudes of the industry and the passive subjugation of the American consumer.

85-87. Monothematic trilogy from a long horizontal banner advertisement running across the top of a page generically titled "Trans … atlantide," in the series "Les samedi de Michelin" and published consecutively between March and April of 1921 in the French magazine *L'Illustration*: "Le 98e Samedi de Michelin," March 19; "Le 99e Samedi de Michelin," March 26, and "Le 100e Samedi de Michelin," April 2.