The Weight Patent Automobile Brake Company Ltd. *David Grimstead, Melksham, March 2021*

Preamble*: At the end of November 2020, I added two paragraphs to the Wikipedia "Hydraulic Brakes" page, which until then attributed the invention of automobile hydraulic four-wheel brakes almost exclusively to Malcolm Loughhead in the U.S.A., c.1914-17 and which perhaps sycophantically, over patriotically or for want of newer, wider sources of information, many other sites reproduce as gospel.*

There is unquestionable evidence available from newspapers and registered patents to propose that it was in fact a Briton, Ernest Walter Weight, who first patented and installed such a system in 1908-9, with the support of his brother, William Herbert Weight. Even their work was patently not a first for hydraulic motor vehicle brake development in the UK, some single wheel hydraulic brakes suitable for motorcycles were patented in Britain in 1902-04.

Perhaps the research carried out for what follows is not new and is common knowledge to some motoring historians but if so, it has not been widely published, if at all:

Weight Patent Automobile Brakes

"**Given the reliability of current car hydraulic braking systems, drivers need think little about them, especially about their history but here, as with much history, it is the too obvious winner who defined how it happened.**

Common knowledge, leastways that offered by a popular web-based encyclopaedia and many other seemingly sycophantic motor car history and supplier web pages, was that Malcolm Loughhead in the U.S.A. was the first to propose the concept of four-wheel hydraulic brakes on a car, by 1914. Subsequently, he obtained a patent around 1917 for what was to become the Lockheed Company. Duesenberg, another American, is declared to be the first to fit four-wheel hydraulic brakes to a racing car and a production car.

Even noted British automotive historian L.K.J. Setright in his 2002 book "Drive On" attributed hydraulic brakes to Duesenberg and Loughhead.

Contradictory earlier history is now readily accessible: British newspapers reported in 1909 that Mr. Ernest Walter Weight of St. Phillips, Bristol, England, had been testing a patentable, all-wheel-compatible, hydraulic oil pressurised braking system for some time before then. Indeed, his system was patented, **GB190800241A**, by December 1908 and was exhibited on a stand at the November 1909 Olympia Motor Show, where it was applauded for its simplicity, smoothness and safety implications. The invention was patented in Great Britain and prominent car manufacturing countries, including the USA.

Ernest Weight, one of seven siblings, had an older brother William Herbert Weight of Bishopston, Bristol, who subsequently obtained an improved automotive hydraulic brake-related patent (**GB190921122A**) and others that were assigned to the Weight Patent Automobile Brake Company by August 1910. These were fully described in the August 1910 U.S.A. Official Patent Gazette; evidently, their developments were known about in the U.S.A.

Described at the time as simple, the Weight's brakes already incorporated dual circuits with two cylinders beneath a common reservoir and a foot pedal, which pressurised two separate pipes connected to cylinders for piston-driven, internally expanding brake shoes within front and rear wheel drums. It also converted the commonly used drive shaft brake into a modern style transmission parking or emergency brake.

The 1909 Weight demonstrator was a 26-h.p. car fitted with the braking system and driven to London and Birmingham automobile manufacturers who reportedly showed interest from which orders were expected and received at the Olympia exhibition if not in 1909, then by 1910. It so impressed the Ocean Accident and Guarantee Corporation insurance company that it offered a ten percent reduction in its car insurance price if the Weight Patent Braking System was fitted.

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The Bristol Times reported it in November 1909. “A NEW INDUSTRY FOR BRISTOL. To interesting observers there might have been during the last few weeks, a motorcar descending the most precipitous hills in and around this district - hills which no motor car had previously been known to negotiate. This was for the purpose of testing a new invention in the shape of a four wheel simultaneous motor brake, upon which the inventor has been working for a considerable time. It is quite agreed amongst motorists in all parts of the world that any invention which tends to the saving of life in connection with motor traffic will be received with open arms by everyone. It is welcome news to the motor world, more especially amongst Bristol Motorists (seeing it is a Bristol invention) that an absolutely perfect brake, which covers every wheel, is now on the market. It is so simple (and simplicity is so important in a patent) that it requires one movement only of the foot pedal to arrest the progress of a motor car within a few feet on the steepest gradient.”

No lesser authority than the Autocar Magazine, referring to the invention that month, said, “There is no doubt that braking on all four wheels is absolutely the only correct system, and the principle employed by the Weight Patent Automobile Brakes Limited seems to leave nothing to be desired in point of accessibility, simplicity, and freedom from liability to go wrong”.

Another article revealed that the hill used for testing the effectiveness of the test car’s braking system and to demonstrate them to prospective buyers was Rownham Road in Bristol.

A manufacturing company, Weight Patent Automobile Brakes Ltd. of 23 Bridge Street, Bristol had been set up by December 1909 under the chairmanship of local financier and alderman, Mr. Peter Featherstone Witty. It was a syndicate company, initially capitalised with £16000 of £1 shares and a statutory shareholder’s meeting was duly held in March 1910 to extol its prospects. It was announced that a factory had been acquired: the Luckwell Works, Luckwell Lane, Bedminster, a site once occupied by precision engineers Humpage, Jacques and Pedersen, which was first put up for sale by the official receiver in 1907.

Based on the 187,773 cars registered in Britain to the end of 1909, Ernest Weight forecast much manufacturing and conversion work for the hundred men the company expected to employ within twelve months.

The new company’s chairman met with major European car manufacturers in Paris during 1910. Following these a Belgian Metallurgique chassis fitted with the Weight Patent Brake system and a body by coachbuilder’s Hill and Boll Ltd. of Yeovil was exhibited at the November 1910 Olympia Motor Show. The Field Magazine described it thus:

“One of the most important and practical features of the show is the Weight Patent Brake, which is an ingenious application of the well-known hydraulic principle. The medium used is oil, which is contained in a small tank behind the brake pedal. This operates two pistons, one of which conveys the oil through steel pipes to the back pair of brakes, and the other to the front pair. By this means the driver is able to exert any amount of brake power upon all four wheels simultaneously by simple foot pressure. The brakes are of the internal expansion type, and each pair of shoes is expanded against the drums by a small piston, into which the oil is forced. The play necessary in the pipes for the rise and fall of the axles and for the turning of the front wheels in steering is furnished by oil tight swivel joints. The great advantage of the system is the perfect compensation attained between each pair of brakes, which has been found particularly necessary in the case of front wheel brakes to prevent deflection of the steering. Another advantage is that there is a total absence of rattle and harshness of application, so that the quickest possible stoppages can be effected without any jerking or undue strain on the chassis. Furthermore, all the brake power is exerted direct on the wheels, and there is no strain whatever on the transmission, as is the case with the ordinary foot brake on the cardan head, which is the one mostly used by the driver. Where the Weight Patent Brakes are fitted, the side lever is disconnected from the back wheel brake and is connected up to the cardan head brake, which is then only used for emergencies or for holding the car when standing still. So far we have only had a short run on the car fitted with these brakes, but it has been sufficient to demonstrate their efficiency, which we venture to state is far in advance of any other brake power hitherto applied to automobiles of any sort. So great is the initial safety, both as regards side slip and stopping power, that at least one insurance company is already allowing a 10 per cent rebate on all cars so fitted. We shall be making more extended trials, especially when we have the brakes on our own car, and will

then go fully into details of the various tests, which we propose to make. Working models and the full size brakes are to be seen on the stand of Hill and Boll, Yeovil, in the annexe."

Weight Patent Brake Company's November 1910 sales advertisements in many London and regional papers carried lurid warnings, claiming serious motor accidents were preventable by fitting their clearly described all-wheel braking system. The name of car manufacturer Arrol-Johnston, who may have been agents for installation in the north, was added for Scottish newspaper adverts:

"ALARMING MOTOR ACCIDENT prevented by braking all Four Wheels. Manufacturers have been trying to obtain a brake acting on the Front Wheels Of a Car as well the rear, but with little success, the mechanism interfering with steering, necessitating constant adjustment. A new brake is now made on the hydraulic system, oil pressure overcoming all difficulties, retaining freedom of steering, with double the power of an ordinary brake, yet perfectly smooth, no strain on transmission, pulls up car in a few feet without shock, reduces tyre bill, insurance premium 10% less. Exhibited on Metallurgique Car Stand 128, Olympia (Hill & Boll), or obtain particulars from Weight Patent Brake Co., Luckwell Works, Bristol, or the Arrol-Johnston Motor Co. Paisley."

Another advert, shorter and to the point, was this: "Weigh Patent front-wheel brakes or brakes on all four wheels. Controlled with one pedal. Very simple, most effective. Stand 128 (Hill and Boll)"

And then... in regional papers at least, nothing. After those adverts appeared, there seems to be no more widespread publicity by or about the Weight brothers or the company. Just one motoring article by a Mr. Basil Crump in the Field Magazine of February 1911, in which the writer rued the fact that he had not had time to have the system fitted before a near accident forced his unstoppable car into a ditch.

Later financial reports and records indicate that Weight Patent Automobile Brakes Ltd. was dissolved sometime between 1916 and 1932. Perhaps the World War intervened in their manufacturing plans but Ernest Weight lived until 1938 and William survived until 1956.

Their system's biggest weakness was undoubtedly its two swivel joints to accommodate the front steering wheels, even though these were a developed feature of William Weight's improved secondary patent. They must have been hard to seal with contemporary materials, exposed and vulnerable underneath the steering's kingpins; although, reports claimed that no oil was lost over many months of use of their 1909 test car.

It is worth mentioning that, five years later, Duesenberg in the U.S.A. put his hydraulic lines directly through the kingpins but used plain water as his hydraulic medium. Sadly, the Weights appeared not to have made use of an ideal solution to the steering problem perhaps already available: Frederick George Heath of the Heath Hydraulic Brake Company Ltd. in Redditch held patents from 1904 for improved flexible (rubber) hydraulic tubing and improvements in hydraulically actuated brakes for cycles and motors.

Apart from the inevitable cost to a new business of prototype development problems, it is interesting to speculate on what caused the company and its promising and well-received patented design principle to disappear from history so abruptly. Perhaps it was just not well-enough financed, although £16,000 in 1910 equates to just under £2M now – not bad start-up capital.

Attracting customers doubtful about four-wheel brakes might have been a problem. Early attempts at mechanical automobile front-wheel brakes had many detractors, not being universally accepted by motorists as safe or desirable; many claimed that inevitable unequal braking across the front axle led to dangerous steering deflection and sideslips. This concern was not unsubstantiated; so dire in design complexity and dangerous in effect were many early mechanical front brake systems, some being diagonally connected to give four-wheel braking, that front brakes were devised and fitted to some well-known British cars reluctantly before the Great War then discarded by them until well after it.

It therefore seems doubly strange that it was Henri Perrot's mechanical four-wheel braking system, on show at the same time as Ernest Weight's, which became the worldwide exemplar of four-wheel brakes well beyond the 1920s. It was only in that decade that hydraulic pressure for all-wheel braking was at last

practically mastered and all-round hydraulic brakes fitted to volume production vehicles. Several makes fitted with Lockheed four-wheel hydraulic brakes were on sale in Britain by 1924.

By then Henri Perrot was a consultant to Lockheed but reporting on the state of four-wheel braking technology in the British Society of Automotive Engineer's 1924 Journal he made no mention of the Weights' contribution to modern car brakes. He must have known about Weight's then unique hydraulic system from when it had appeared amongst the only half dozen all-wheel braking systems displayed at the 1910 Olympia Show, because these had included the much cruder mechanical one Perrot designed at Argyll Motors, which would nevertheless prove acceptably effective until hydraulics were perfected. Coincidentally, Argyll Motors was a nearby rival to Arrol-Johnston, the Weight Company's Scottish agents. It would be another thirty years before mechanical brakes were fully supplanted by hydraulics.

Perhaps now we should give Ernest Weight (1875-1938) and William Weight (1869-1956) their due: an even break in the history of car brakes."

David Grimstead, March 2021.

Information sources and reparation notes:

My sequence of events and "story" above are mostly derived from newspapers; I have no access to automotive libraries currently, except my own precious few books. Hence, most facts were gleaned from the newspaper texts and from the patents of the Weight Brothers, which include drawings of their four-wheel hydraulic brake layouts. These are included below but originals are easily found on web patents sites (Google Patents, American Patent Office, Euro Patents, etc) once you know about them.

I suspect that some editions of the Motor, Autocar and other motoring periodicals from 1908-12 at least might contain some more Weight information, should any such editions have survived.

Some comments about Perrot were found on websites.

The downloaded patents have not been fully "translated" and hence still contain much gobbledegook!

Earnest and William Weight were born in Clifton, Bristol according to BMD; deaths also recorded on there and in newspapers.

There is a section at the end on Malcolm Loughhead, as one unsubstantiated web forum comment found says he started work on hydraulics in 1901 – but then he was only 15 and not yet employed in automobile engineering. None of it undermines the reality that the Weights designed and installed 4-wheel hydraulic brakes well before Loughhead patented his version.

The news reports are presented roughly in date order. Please note that all the newspaper extracts pictured below were extracted from the National Newspaper Archive on a personal-use basis. They have restrictions on commercial use of their images.

The Weight Patent Automobile Brake Company Ltd. *David Grimstead, Melksham, March 2021*

Ernest Weight's 1908 Patent part description:

GB190800241A

United Kingdom

Improvements in or relating to Brakes of Automobiles.

Abstract

241. Weight, E. W. Jan. 4. Motor road vehicles.-Hydraulic brake-operating mechanism consists of a main hydraulic cylinder b, connected by pipes f to cylinders g adapted to apply brakes, of either the internal expanding or band type, to the road wheels. The piston c of the main cylinder is operated by a pedal d, or hand-lever e, or both. Brakes may be applied to both the steering and driving wheels. The main cylinder is provided with a port b<1>, which communicates with a reservoir b<3>. When the brakes are off, the piston clears the port, so that any leakage of liquid is made good from the reservoir.

1908-01-04
Application filed by Ernest Walter Weight
1908-01-04
Priority to GB190800241T
1908-12-03
Application granted
1908-12-03
Publication of GB190800241A
Status
Expired

William Weight's 1910 Patent Description:

Improvements in or relating to Brakes of Automobiles and like Vehicles.

Abstract

21,122. Weight, W. H. Sept. 15. Hydraulic transmission. - Relates to motor road vehicles having fluid - pressure brakes connected by flexible tubing to a common pressure source operated by a pedal. The pressure cylinder 9 is provided with a loose fitting plunger 23 operated by a pedal 26. Pipes 11, coiled as shown-at 12 to give elasticity, lead from the cylinder 9 to brake cylinders 5 operating the usual brake-gear 4 on the road wheels. In the case of the steering-wheel brakes, a 'swivel joint constructed as shown in Fig. 5 is used, the pipe 11 being extended into a socket 18 situated in line with the steering- pivot, and secured by a screwed bush 20, a cone joint being formed at 22. When the pedal 26 is released, it opens a spring-closed valve 29 through a lever 27, and thereby makes communication between the cylinder 9 and a tank 8 so that the cylinder may be replenished, and any air may escape therefrom. Specification 241/08 is referred to.

Classifications

B60T11/10 Transmitting braking action from initiating means to ultimate brake actuator without power assistance or drive or where such assistance or drive is irrelevant transmitting by fluid means, e.g. hydraulic

William Weight Patent Description:

'W. H. WEIGHT. BRAKE FOR ROAD VEHICLES/ APPLICATION FILED DEO.15, 1909.
Patented Aug. 9, 1910.
2 SHEETS-SHEET 1.
W. H. WEIGHT. BRAKE FOR ROAD VEHICLES.
APPLIQATION FILED 1330.16, 1909.
Patented Aug. 9, 1910.
2 SHEETS-SHEET 2.
' Erma) mwrinf I 3/7513 Jaw-12 1. mes -. Be it known t 'at ,1, ' wnamm nnnnnn'r'wmenn or msriors'ron, nms'ron, 3mm: ron' noAn-vnmcms.
Specification 01 Letters Patent. Application alea December 15, 1969. serial no. 533,182
Patented-Aug. 9; 1910.
To all whom it ma concern:

The Weight Patent Automobile Brake Company Ltd. *David Grimstead, Melksham, March 2021*

WILLIAM HERBERT WEIGHT, a subject of the King of 'England, residing at Bishopston, Bristol, in England, have invented certain new and useful Improvements in Brakes for Road-Vehicles, of which the following is a specification.

This invention relates to liquid operated brake mechanism for automobiles and like vehicles of the type wherein the brake-blocks are operated by pistons acting like hydraulic rams connected to a common source of fluid pressure, and it consists in improvements in the tubing leading to the several cylinders of the said piston in the connections to those of the brakes of the steering wheels, in the main pressure producing device, and in the means of replenishment of the latter with liquid and the release of air there from. In brake mechanism of this type it is essential that the tubular connections .between the main pressure producer and the several hydraulic rams should be capable of withstanding the destructive effect not the vertical movements of the road wheels with respect to the frame of-the vehicle and the vibrations to which the tubing is subjected. When applied to brakes of steering wheels it is further essential that the tubing be not deram cylinder a resilient tube of copper or destroyed or fatigued by the deflection of the wheels.

1 In the present invention I employ between the main pressure reducer and the brake steel firmly connected at each end and coiled or partly coiled at someplace or places intermediate of its ends so that the pipe as a whole has sufficient elasticity to permit of the movements of the brake ram cylinder without destruction of the pipe or of its connections. This pipe is so shaped as to lie freely without contact with the frame of the vehicle and is sufficiently rigid to be self supporting, although if desired it may receive additional support from spring suspenders or the like. Where the pipe is connected to the ram cylinder on a steering wheel a swivel joint is placed in the pipe an aligned with the axis of the steering socket preferably beneath the getter (gaiter?). This joint is of a kind to permit lateral swinging of the section-of the pipe between it and the steering wheel in order to follow the movements of the steering wheel.

In the main pressure cylinder, I provide a plunger which is of less diameter than the cylinder in which it works-and when in the off position is clear of the replenishing pipe. The plunger passes through a cup of leather which is preferably secured between the cylinder and its head or collar through which the plunger passes. ... therefore does not act directly to open and The plunger v close the port in the cylinder wall through which the cylinder is replenished with liquid to compensate for accidental leakage, but such port is controlled by a check-valve. This check valve may be free to be operated by the pressure of the liquid, but I prefer to render its action more certain by a mechanical connection controlled by the movements of the pedal or lever by which-the brakes are put in action, For this purpose I may use a plug-valve or cock or a poppet valve pressed into closed position by a spring and opened by a plunger connected mechanically to an abutment against which the pedal or level aforesaid presses when approaching its position of rest with the brakes off. By this means the port is held open to the replenishment chamber when. the brakes are off and any air that might have been present in the main reservoir cylinder is allowed free escape and the lid d free access, whereas when the brakes are to be put on, the initial movement of the pedal or lever permits the spring to close the valve and prevents escape of liquid from the main pressure cylinder to the replenishment chamber illustrated in the annex drawings, in which These improvements are Figure 1 is a longitudinal sectional elevation of the chassis of a motor road vehicle showing certain of my improvements applied thereto; Fig. 2 is a plan view of Fig. l, and Fig.3 a front end view thereof; Fig. 4 is a sectional detail view on an enlarged scale showing the air release or. Check 'valve and Fig. 5 is a sectional detail view also on an enlarged scale showing a swivel joint for a steering wheel. '5. In the said drawing's 1 designates) the frame of the vehicle and 2 the road wheels thereof each of which is provided with the brake-drum 3 and interior brake-mechanism 4 of construction including brake ram cylinders 5. The main pressure producer - 6 is shown as located adjacent the 1t dash board on which is the reservoir 8 for pressure liquid in communication with the main pressure cylinder 9 by means -.each 5. of a pipe 10. Between said cylinder 9' and of the brake ram cylinders is interposed a tube of copper or steel 11 provided with a coil as at 12. This may be a complete coil as illustrated or only a partial one or more than one coil may be provided in leading couple larly lilig. 2.) each tube in order to still further increase the resiliency of said tubes. The pipes 11 to the fore or steering wheels are together by a transverse member .13 from which a branch 14 leads to the cylinder 9 and the pipes leading to the rear' wheels are similarly connected by a similar transverse member extending into a connection j15 {on the cylinder (see more particularly The connection of the pipes 11 to the steering wheels is effected as shown more particularly in Figs.'3 and- 5,by means of a swivel joint 16 disposed in axial alignment with the steering socket 17 immediately flared and bevelled at the top, as at 22 and bears upon a similarly bevelled portion of the bus g 20. A lock nut 23, is provided on the exterior of said bushing and the outer portion thereof is faced for reception of a wrench for adjusting purposes.

" Referring now more particularly to Fig. 1 the main pressure cylinder 9 contains the plunger 23 of less diameter than said cylinder. The said plunger passes through the cup-leather 24 and cylinder head 25 and is connected to the foot brake lever 26 by means of a link 27. 28 shows the port in the cylinder into which the connection 10 from the reservoir 8 leads, and in said connection is interposed the check valve 29 previously referred to and a form of which 1s illustrated in detail in Fig. 4, from which :it will be seen that said valve comprises the casing 30 provided with two liquid channels 31 and 32 adapted to be placed into or out of communication by means of the valve body 33 normally held closed against its seat by a helical spring 34 and carried by a rod 35 extending through a gland or stuffing box 36 and bearing against a double-armed ever 37 38 connected to the brake lever 26. It thus be seen that .when the brakes are off as in the position of the parts shown in Fig. 1 the valve will be open and allow liquid to enter the cylinder-9- whereas when the lever is moved forward to apply the brakes the valve will be closed and thus cut off communication between said cylinder and the reservoir 8.

I do not limit myself to the exact construction and arrangement of parts herein- I '1. In a hydraulic brake s stem for road vehicles the combination with a brake ram cylinder carried by steering wheel of a vehicle, and a main pressure device, of a resilient tube connected at opposite ends to sand cylinder and pressure device and a swivel joint interposed in the length of said tubing and aligned with the pivotal axis of the steering wheel.

2. In a hydraulic brake system for road vehicles the combination with a brake ram cylinder carried by each of the vehicle wheels and a main pressure device supported by the vehicle, of resilient tubes each connected at opposite ends to a brake ram cylinder and to the main pressure device, a swivel joint interposed in each of said tubes which communicate with the ram cylinders of the steering wheels, said joint being aliened with the pivotal axis of the steering wheel, and all the aforesaid tubes being partially coiled and so disposed-as to avoid contact with the vehicle framing.

3.- vehicles, the combination with a brake ram cylinder carried by a vehicle wheel of a main pressure device including a cylinder, a plunger therein, of less diameter than said cylinder and a cup leather at one end of said cylinder in which said plunger slides and a connection from said ram cylinder to said pressure device.

4. In a hydraulic brake s stem for road vehicles the combination 0 a brake ram cylinder carried by a vehicle wheel, a main pressure device including a cylinder, a plunger therein of less diameter than said cylinder and a cup leather at one end of, said cylinder in which said plunger slides, and a resilient tube connected at opposite ends to said ram cylinder and pressure device, said tube being partially coiled and so disposed to the cylinder, a valve in said connection, a plunger operating member and connections between the latter and the valve a hydraulic brake system for road, whereby said valve is held open when the operating member is in its off position and closed during the initial movement of the latter from said position.

6. In a hydraulic brake system for road vehicles, the combination of a brake ram cylinder carried by each of the 'vehicle wheels a main pressure device including a cylinder supported by the vehicle, resilient tubes each connected at opposite ends to a brake ram cylinder and to said pressure device, said tubes being partially coiled and so disposed as to avoid contact with the vehicle framing a plunger Working in the pressure cylinder, a liquid reservoir, a connection from the latter to the cylinder, a valve in said connection, a plunger operating member and connections between the latter and the valve whereby said valve is held open when the operating member is in its off position and closed during the initial movement of the latter from said position.

In witness whereof I have signed this specification in the presence of two witnesses. 25
WILLIAM HERBERT WEIGHT.

Witnesses: W. M. Pmu'r, FREDK. N. Jones.

Inventor: William Herbert Weight

GB190921122A United Kingdom

W. H. WEIGHT.
BRAKE FOR ROAD VEHICLES.
APPLICATION FILED DEC. 15, 1909.

966,722. Patented Aug. 9, 1910.

2 SHEETS—SHEET 2.

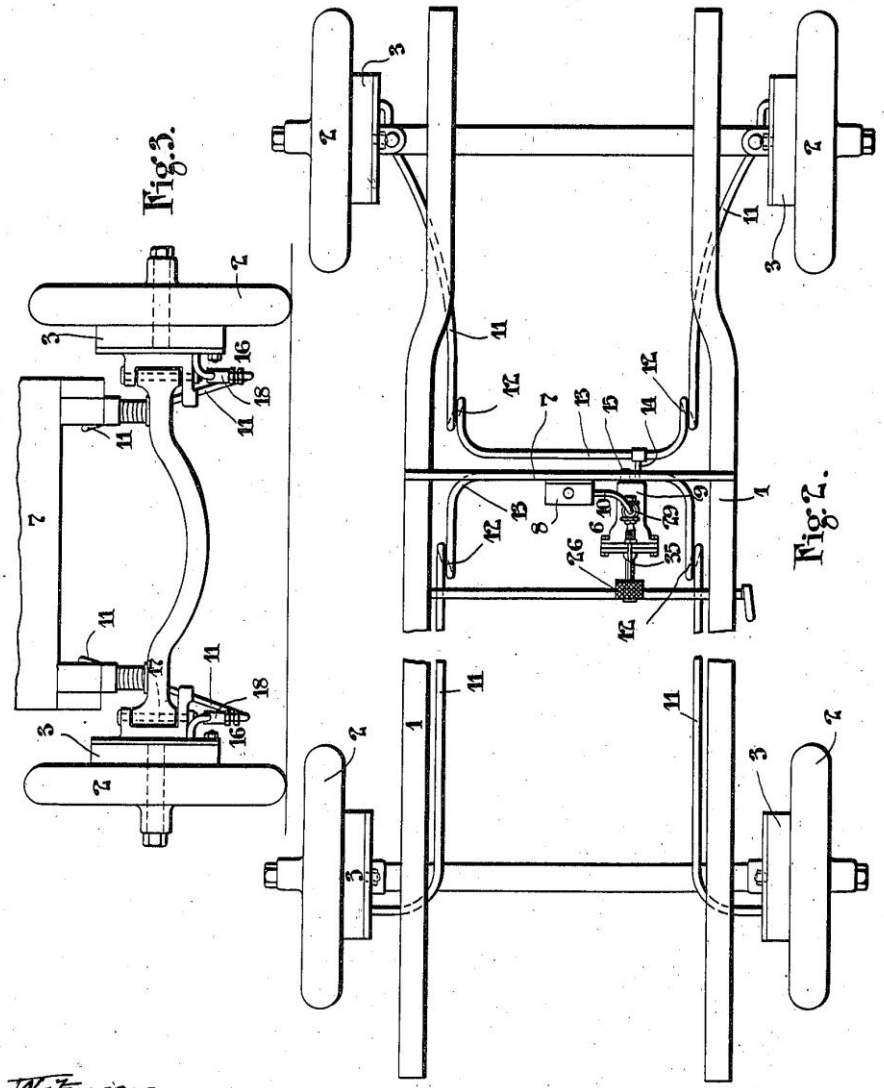


Fig. 2.

Fig. 3.

Witnesses
A. J. Haddan
A. E. Hathaway

Inventor
William Herbert Weight
by his Attorney. R. Haddan

GB190921122A United Kingdom

W. H. WEIGHT.
BRAKE FOR ROAD VEHICLES.
APPLICATION FILED DEC. 15, 1909.

966,722. Patented Aug. 9, 1910.

2 SHEETS—SHEET 1.

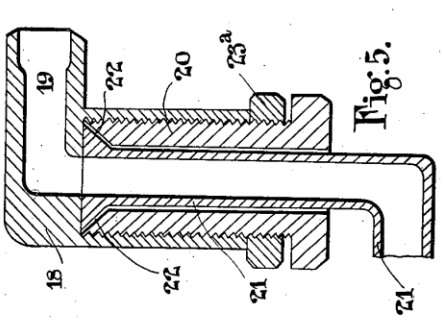


Fig. 5.

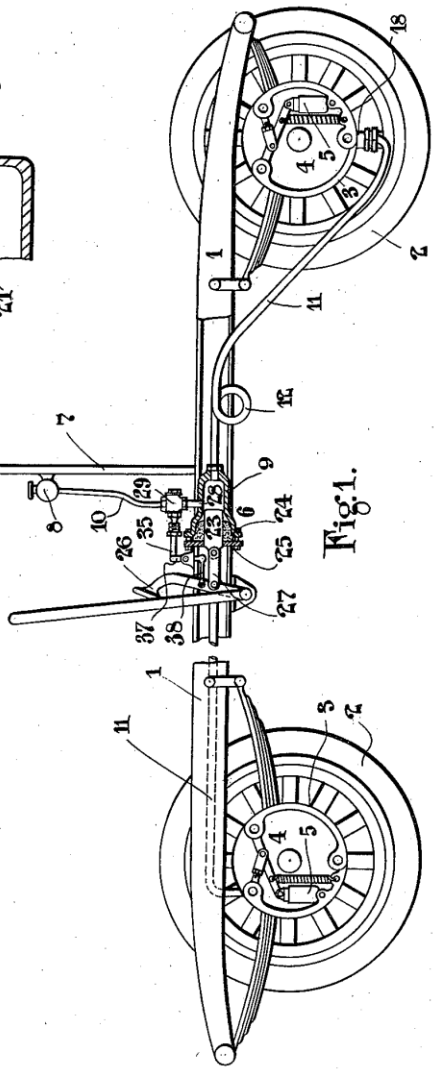


Fig. 1.

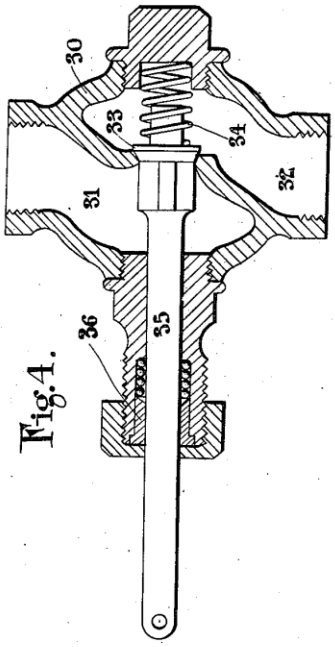
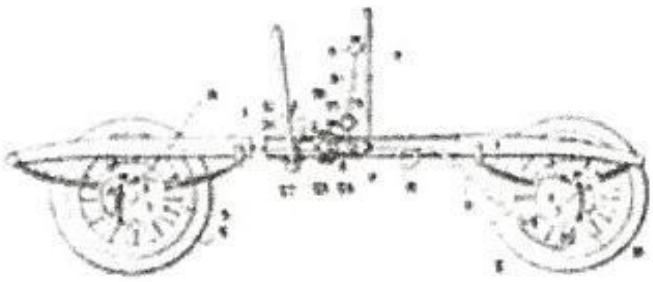


Fig. 4.

Witnesses
A. J. Maddern
A. Hathaway

Inventor
William Herbert Weight
by his Attorney R. Maddern

966,722. BRAKE FOR ROAD-VEHICLES. WILLIAM HERBERT WRIGHT, Bishopston, Bristol, England. Filed Dec. 15, 1909. Serial No. 533,182.



1. In a hydraulic brake system for road vehicles the combination with a brake ram cylinder carried by steering wheel of a vehicle, and a main pressure device, of a resilient tube connected at opposite ends to said cylinder and pressure device and a swivel joint interposed in the length of said tubing and alined with the pivotal axis of the steering wheel.

2. In a hydraulic brake system for road vehicles the combination with a brake ram cylinder carried by each of the vehicle wheels and a main pressure device supported by the vehicle, of resilient tubes each connected at opposite ends to a brake ram cylinder and to the main pressure device, a swivel joint interposed in each of said tubes which communicate with the ram cylinders of the steering wheels, said joint being alined with the pivotal axis of the steering wheel, and all the aforesaid tubes being partially coiled and so disposed as to avoid contact with the vehicle framing.

3. In a hydraulic brake system for road vehicles, the combination with a brake ram cylinder carried by a vehicle wheel of a main pressure device including a cylinder, a plunger therein of less diameter than said cylinder and a cup leather at one end of said cylinder in which said plunger slides and a connection from said ram cylinder to said pressure device.

4. In a hydraulic brake system for road vehicles the combination of a brake ram cylinder carried by a vehicle wheel, a main pressure device including a cylinder, a plunger therein of less diameter than said cylinder and a cup leather at one end of said cylinder in which said plunger slides, and a resilient tube connected at opposite ends to said ram cylinder and pressure device, said tube being partially coiled and so disposed as to avoid contact with the vehicle framing.

5. In a hydraulic brake system for road vehicles, the combination of a brake ram cylinder carried by a vehicle wheel, a main pressure device including a cylinder a connection from the pressure device to the ram cylinder, a plunger working in the pressure cylinder, a liquid reservoir, a connection from the latter to the cylinder, a valve in said connection, a plunger operating member and connections between the latter and the valve whereby said valve is held open when the operating member is in its "off" position and closed during the initial movement of the latter from said position.

[Claim 6 not printed in the Gazette.]

Extract of Official US Patent Gazette August 1910 detailing William Weight's improved 1910 patent.

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Newspaper reports and other reported comments from 1909 to 1911:

A NEW INDUSTRY FOR BRISTOL.

To interesting observers there might have been seen during the last few weeks a motor-car descending the most precipitous hills in and around this district—hills which no motor-car had previously been known to negotiate. This was for the purpose of testing a new invention in the shape of a four-wheel simultaneous motor brake, upon which the inventor has been working for a considerable period. It is quite agreed amongst motorists in all parts of the world that any improvement which tends to the saving of life in connection with motor traffic will be received with open arms by everyone. It is welcome news to the motor world (more especially amongst Bristol motorists, seeing it is a Bristol invention) that an absolutely perfect brake, which covers every wheel, is now on the market. It is so simple (and simplicity is always an important feature in patents) that it requires one movement only of the foot pedal to arrest the progress of a motor-car within a few feet on the steepest gradient. Passengers, when they become acquainted with this fact, will be very glad. Owners of motor-cars will undoubtedly be only too pleased to adopt such a method of safety for their cars, knowing they have nothing to fear when descending the steepest hills. An important feature also in regard to the patent is that of easy riding, so much so that the car is pulled up to a nicety, and the rider cannot feel the slightest jerk or inconvenience. It may also be added that the value of the brake is considerably enhanced by the important fact that it prevents side-slip, and there is also a great saving in the wear of tyres. Motor experts and others who have seen and tested the brake by having a run on it, have been delighted with its movement, and the sense of security which is felt when going down steep hills, and nothing but success for the patent is prophesied. The patent was exhibited at the Olympia Show from the 12th to the 20th inst., and met with universal approval by the very large number of people who came to the stand to see it. The leading motor manufacturers of this country, as well as some Continental makers, strongly emphasised the value of the patent. The company was successful in securing orders at the show, and an unusual large number of inquiries for prices and particulars. The invention has been patented in Great Britain and all foreign countries. A syndicate has recently been formed for operating the patent and the offices are at 23, Bridge Street, Bristol (the offices of Mr. Featherstone Witty, secretary to the company, under the title of the Weight Patent Automatic Brakes, Limited, where inquiries are elicited. 'The Autocar,' referring to the invention, says: "There is no doubt that braking on all four wheels is absolutely the only correct system, and the principle employed by the Weight Patent Automatic Brakes, Limited, seems to leave nothing to be desired in point of accessibility, simplicity, and freedom from liability to go wrong."

WESTERN DAILY PRESS, BRISTOL. WEDNESDAY, NOVEMBER 24, 1909.

The Weight Patent Automobile Brake Company Ltd. *David Grimstead, Melksham, March 2021*

'The Autocar' of November 1909, referring to the patented invention of four-wheel hydraulic car brakes by Bristolian Ernest Weight, said, "There is no doubt that braking on all four wheels is absolutely the only correct system, and the principle employed by the Weight Patent Automobile Brakes Limited seems to leave nothing to be desired in point of accessibility, simplicity, and freedom from liability to go wrong".

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"The Autocar," describing the patent, says: "The principle is one in which a piston or pistons operated by the brake pedal are caused to operate, through the medium of a fluid, smaller pistons which in turn actuate internal expanding metal-to-metal brakes, the connection being through copper pipes swivelled, in the case of the front wheels, through the steering centre line in order to obviate any distortion or strain on the mechanism. When all four brakes are worked on this method, the brake pedal operates two pistons, one of which applies to the front wheels, the other to the rear wheels. This being the case, it is almost impossible for the brakes to fail, as it is extremely unlikely that anything could go amiss with both separate systems together. The hand brake is retained in the system, and is applied to the counter-shaft brake in the place of the usual footbrake. There is no doubt that braking on all four wheels is absolutely the only correct system, and the principle employed by the company seems to leave nothing to be desired in point of accessibility, simplicity, and freedom from liability to go wrong."

BRISTOL TIMES AND MIRROR, WEDNESDAY, NOVEMBER 24 1909.

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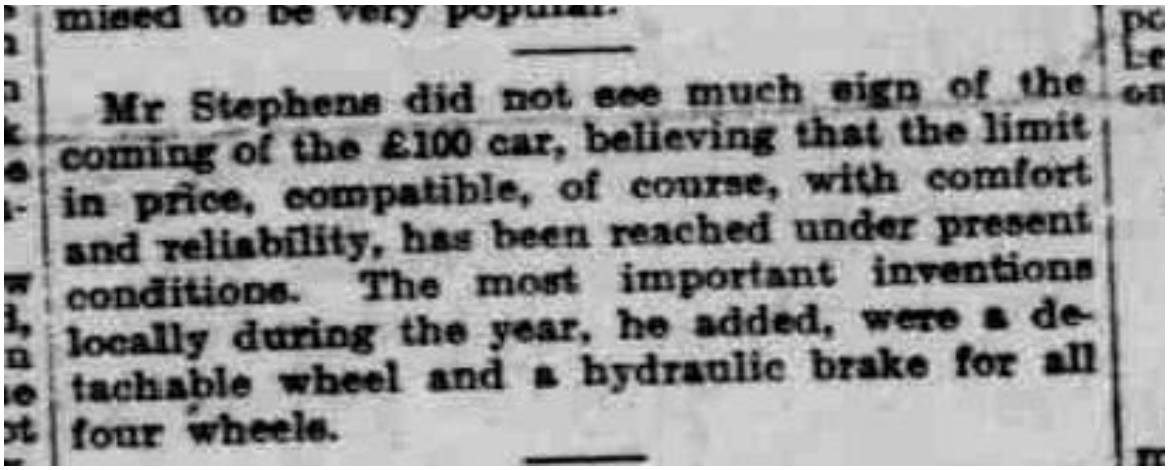
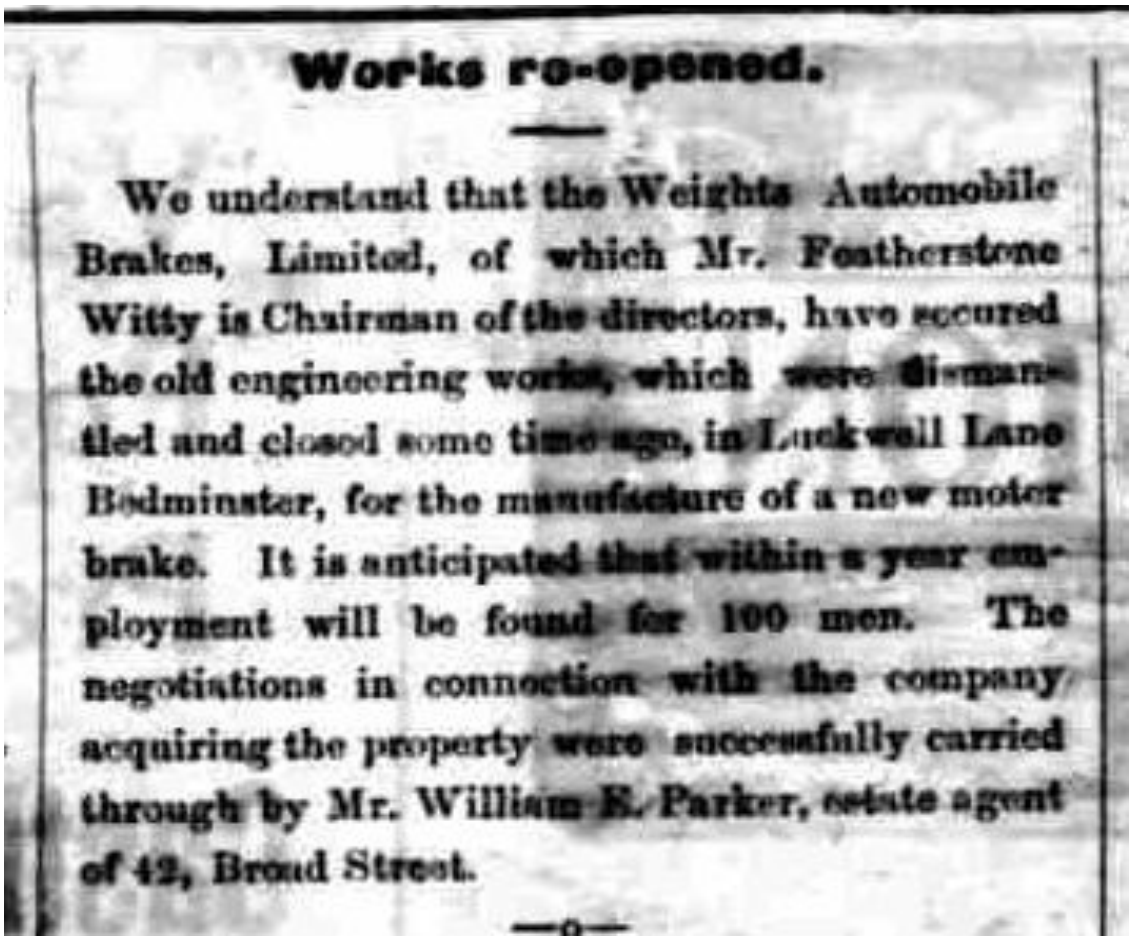


missed to be very popular.

Mr Stephens did not see much sign of the coming of the £100 car, believing that the limit in price, compatible, of course, with comfort and reliability, has been reached under present conditions. The most important inventions locally during the year, he added, were a detachable wheel and a hydraulic brake for all four wheels.

Western Daily Press - Friday 31 December 1909. Howard Stephens was a Bristol motoring commentator.



Works re-opened.

We understand that the Weights Automobile Brakes, Limited, of which Mr. Featherstone Witty is Chairman of the directors, have secured the old engineering works, which were dismantled and closed some time ago, in Luckwell Lane Bedminster, for the manufacture of a new motor brake. It is anticipated that within a year employment will be found for 100 men. The negotiations in connection with the company acquiring the property were successfully carried through by Mr. William E. Parker, estate agent of 42, Broad Street.

South Bristol Free Press and Bedminster, Knowle & Brislington Record - Saturday 12 February 1910

Jacques and Pedersen Ltd. who made measuring equipment had the Luckwell works from at least 1904; up for receiver auction 1907.

THE WEIGHT PATENT AUTOMOBILE BRAKES, LD., BRISTOL.

The statutory meeting of the above company was held at the offices, [illegible], Bridge-street, yesterday afternoon. Mr. [illegible] Witty (chairman of the company) presided, and said: This is the statutory meeting of the Weight Patent Automobile Brakes, Limited, and is held in accordance with the demands of the law. The company was formed on the 22nd day of December [illegible] for the purpose of taking over the patent for a four-wheel simultaneous brake for motor-cars and other vehicles, the invention of Mr. E. W. Weight, engineer, of St. Philip's, Bristol. The capital of the company was fixed at £16,000, in 16,000 shares of £1 each, of which 8,100 have been allotted. The English patent has been duly granted, and measures are being taken to complete the patents in the great civilised countries of the world. Patents are subject to more or less plausible objections by patent offices in foreign countries, it being the natural desire of the officials in them to give their own people every opportunity to utilise inventions for similar purposes even when they are obviously of inferior importance and ingenuity. The overcoming of these objections, of course, takes time; but, when the invention is so simple and original, and of such vital importance to the public safety, as we think our own is, the overcoming of their objections is usually sooner or later achieved. Although the company has been incorporated for so short a time, a very considerable amount of work has been done in connection with it. Prior to the incorporation, the brake was exhibited at the great Olympia Motor Show in November last, and a large number of persons interested in motoring inspected it, and, without a single exception, pronounced it to be the best and most complete on the market; and since then we have received a number of inquiries in regard to it. In order to demonstrate, a 20-h.p. car was purchased, and the brake affixed, and one of the directors, who has considerable influence with motor manufacturers, took it around to the great works in London, with what we expect will be most important and satisfactory re-

great works in London, with what we expect
will be most important and satisfactory results. In addition to this, the car has been tested by some of the large motor manufacturers in Birmingham and the district, and has met with their hearty approval. We have, therefore, reason to believe that the outlook is bright, and that we may expect to have a considerable number of orders as soon as we are able to manufacture. In making this statement I have purposely erred on the side of being moderate and conservative, and it is probable that I have considerably underestimated the enormous possibilities which attach to a useful and important invention such as our own. For example, it is tolerably certain that the authorities in London will, in consequence of the great increase of mototraction, and the large number of street casualties consequent upon this state of things, insist upon a more perfect system of braking to vehicles than is at present current; and, inasmuch as the arresting of a vehicle in motion can be more promptly and effectually accomplished by the simultaneous application of equal pressure distributed over four wheels than two, it is obvious that a perfectly simple system such as ours must find favour with them, and we shall not fail to bring it before them at the first opportunity. Moreover, we have agreed that the royalty fees on the brake should be made as low as the circumstances justify. Our invention minimises enormously the risk to life and limb which is the natural concomitant of motor traffic; and although it is said that philanthropy in business is a mistake, yet we feel that the two can be profitably combined; hence, we have agreed to reduce the royalties we had at first decided upon considerably, and we believe this will encourage the use of our system, and that the results will be profitable alike to the public safety and to ourselves. I do not think I am betraying confidences when I say that I believe that that magnificently-managed local company, the Bristol Tramways and Carriage Company,

the Bristol Tramways and Carriage Company, have also been most favourably impressed with our system; and, although I have no authority for saying so, I have a strong impression that when they manufacture a further supply of their splendid taxi-cabs our brake will find a place in their mechanism, and that they will once more demonstrate their anxiety to encourage and enlarge the scope of useful local industries. I was in Paris last week, and had an interview with the agent of a firm of motor manufacturers who had previously made trial trips to test the brake on the steep declivity of Rownham Hill, Bristol, and had expressed himself in most favourable terms concerning it. He confirmed his previous views to me in Paris, and I have reason to hope that his co-operation to popularise our system will be secured. One of the most important testimonials to the value and importance of our brake has been furnished by the Queen Accident and Guarantee Corporation, Limited. This company has made the important announcement that it will reduce the premium by 10 per cent. on motor-cars which have our brake attached. We have secured premises formerly owned by Messrs. Hemmage, Jacques, and Pedersen, in Lockwell Lane, Bedminster, at a very reasonable annual rental; and we are considering tenders to put them in a condition suitable for our manufacturing requirements, which should not occupy a long period of time. It is estimated by Mr. F. W. Weight, the inventor, that before the expiration of twelve months the demand for our brake will have so grown that we shall be employing a large number of hands at our works; and I trust this may be the case, and that we may be able in this way to find employment for capable and industrious hands. My own views in regard to the relationship between employers and employés is that a system of profit-sharing is most advantageous to all concerned, and, if this meets with the approval of my fellow-directors, we shall at a suitable moment institute it. In conclusion, we want to make our patent the origin of a great, successful, local industry; and, considering that there were 183,773 motor-cars registered in the United Kingdom by the end of September 1909, and that our brake is, in the judgment of both manufacturers and experts, a sine qua non for the safe navigation of the streets, thoroughfares, and roads through which motor vehicles are passing in ever-growing numbers, we have great hope that we shall be able to do so. Bristol is the centre of the great cocoa industry carried on by the world-renowned firm of Messrs. J. S. Fry and Sons, and of the Imperial Tobacco Company's industry, with whose colossal buildings we are all familiar; and I am glad to say that, with their usual patriotism, we have important members of these two splendid local industries as shareholders. These great industries started in a small way; they each met a felt want; they both kept up the standard of quality; they have both been enormously successful. If our brake be, as we hope and believe it is, the most suitable and powerful of its kind in the world, we shall hope, by copying the example of the two great concerns I have mentioned in every respect, to build up a remunerative, extensive, and profitable enterprise. The chairman's speech was listened to with great attention, and unanimously approved by those present.

BRISTOL TIMES AND MIRROR, FRIDAY, MARCH 18 1910.

Rownham Hill mentioned

Brakes.

WEIGHT PATENT FRONT-WHEEL BRAKES or BRAKES on all Four Wheels. Controlled with one pedal. Oil pressure. Very simple, most effective. Stand 128 (Hill and Boll).

WESTMINSTER GAZETTE. NOVEMBER 3, 1910

Weigh Patent Front-Wheel Brakes or Brakes on All Four Wheels. Controlled with one pedal. Very simple, most effective. Stand 128 (Hill and Boll).

SERIOUS MOTOR COLLISION

prevented by braking all **Four Wheels.** Manufacturers have been trying to obtain a brake acting on the **Front Wheels** of a car as well as the rear, but with little success, the mechanism interfering with steering, necessitating constant adjustment. A new brake is now made on the hydraulic system, oil pressure overcoming all difficulties, retaining freedom of steering, with double the power of an ordinary brake, yet perfectly smooth, no strain on transmission. Pulls up a car in a few feet without shock, reduces tyre bill, insurance premium 10% less. Exhibited, on a Metallurgique Car at Stand 128, Olympia (HILL & BOLL), or obtain particulars from WEIGHT PATENT BRAKE Co., Luckwell Works, Bristol.

DAILY NEWS. MONDAY. NOVEMBER 7.

ALARMING MOTOR ACCIDENT

prevented by braking all FOUR WHEELS. Manufacturers have been trying to obtain a brake acting on the FRONT WHEELS of a car as well as the rear, but with little success, the mechanism interfering with steering, necessitating constant adjustment. A new brake is now made on the hydraulic system, oil pressure overcoming all difficulties, retaining freedom of steering, with double the power of an ordinary brake, yet perfectly smooth, no strain on transmission. Pulls up a car in a few feet without shock, reduces tyre bill, insurance premium 10% less. Exhibited on a Metallurgique Car at Stand 128, Olympia (HILL & BOLL), or obtain particulars from WEIGHT PATENT BRAKE Co., Luckwell Works, Bristol, or the ARROL-JOHNSON MOTOR Co., Paisley.

SCOTSMAN, WEDNESDAY, NOVEMBER 9, 1910.

50% OF MOTOR ACCIDENTS

prevented by braking all Four Wheels simultaneously. Manufacturers have been trying to obtain a brake acting on the Front Wheels of a car as well as the rear but with little success, the mechanism interfering with steering, necessitating constant adjustment. A new brake is now made on the hydraulic system, oil pressure overcoming all difficulties, retaining freedom of steering, with double the power of an ordinary brake, yet perfectly smooth, no strain on transmission. Pulls up a car in a few feet without shock, reduces tyre bill, insurance premium 10 per cent. less. Exhibited on a Metallurgique Car at Stand 128, Olympia (Hill and Boll), or obtain particulars from Weight Patent Brake Co. (Ltd.), Luckwell Works, Bristol. 7934

WESTERN MAIL. THURSDAY. NOVEMBER 10. 1910.

FATAL MOTOR ACCIDENT

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DAILY NEWS. WEDNESDAY. NOVEMBER 9. 1910.

WESTERN MAIL, WEDNESDAY, NOVEMBER 9, 1910.

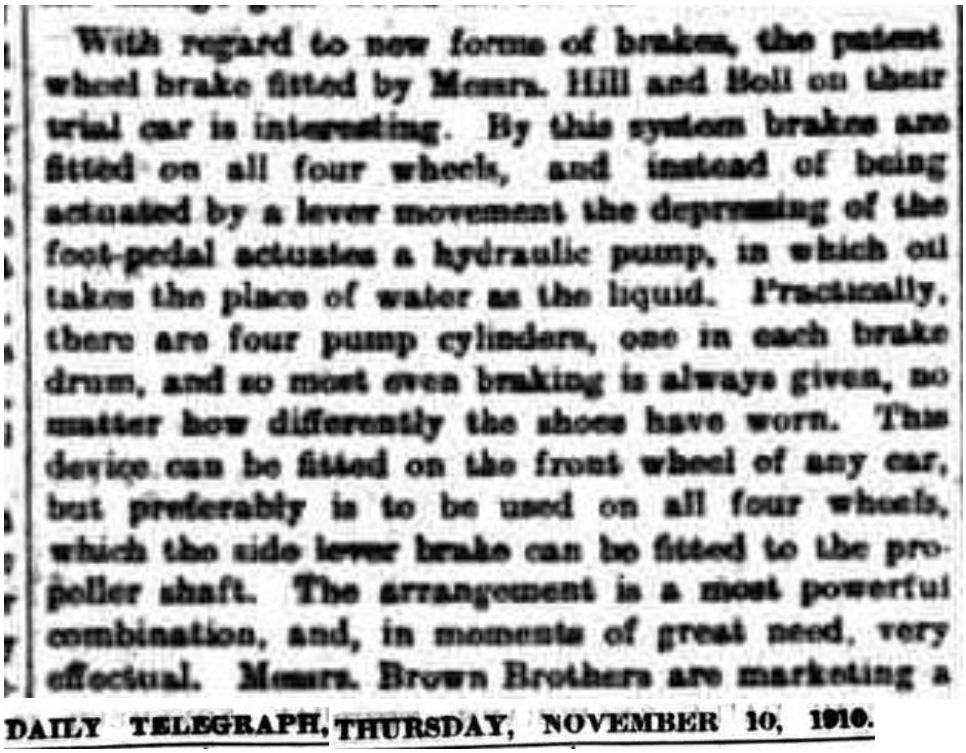
Colonial conditions.

A NEW BRAKE DEVICE.

As every motorist knows, brakes form a very important component part of the mechanical equipment of a car. Improvements are not only being incorporated in the ordinary rear wheel brakes, but manufacturers are also turning their attention to the subject of brakes on the front wheels. An ingenious system of brakes fitted to a Metallurgique chassis is to be seen at the Olympia Exhibition. This brake (the Weight Patent) can be made to act simultaneously on all four wheels by means of the ordinary pedal, or, if so desired, the operation can be arranged for the front wheels only. The motive power is conveyed by means of oil, the pressure applied to the pedal being thus communicated to the brake mechanism. It is claimed that absolute smoothness of application follows as a *sine qua non* from the usage of a fluid pressure. The oil is contained in a small reservoir, approximately four inches square, fitted with two small cylinders, the pistons of which are directly connected to the pedal. On depressing the pedal, the supply of oil is automatically cut off from the reservoir and deviated into the smaller cylinders, which are attached to the combined levers contained in the brake drums. In thus conveying the power through the means of a fluid, it would appear that compensation of the action would be to a large extent automatic, and as a matter of fact in a car so fitted mechanical methods for obtaining this desideratum for a balanced application of power are dispensed with. We understand that an equipment of these brakes has been in continual use for several months without requiring a replenishment of the oil in the reservoir.

ELECTRIC LIGHTING.

SCOTSMAN, THURSDAY, NOVEMBER 10, 1910.



With regard to new forms of brakes, the patent wheel brake fitted by Messrs. Hill and Boll on their trial car is interesting. By this system brakes are fitted on all four wheels, and instead of being actuated by a lever movement the depressing of the foot-pedal actuates a hydraulic pump, in which oil takes the place of water as the liquid. Practically, there are four pump cylinders, one in each brake drum, and so most even braking is always given, no matter how differently the shoes have worn. This device can be fitted on the front wheel of any car, but preferably is to be used on all four wheels, which the side lever brake can be fitted to the propeller shaft. The arrangement is a most powerful combination, and, in moments of great need, very effectual. Messrs. Brown Brothers are marketing a

DAILY TELEGRAPH, THURSDAY, NOVEMBER 10, 1910.

MOTOR BRAKES.

It is hardly necessary to make the statement that, of the many component parts in the mechanical equipment of a car, the brake system undoubtedly holds a position of pre-eminence. The actual fact of operating in synchronisation both front-wheel and rear-wheel brakes is not in itself new. Messrs. The Weight Patent Automatic Brakes (Limited) are putting on the market an ingenious system, in which this combination is incorporated; but the actual operation is, in many respects, novel. The brake can be made to act simultaneously on all four wheels by means of the ordinary pedal, or, if so desired, the operation can be arranged for the front wheels only. The motive power is conveyed through the means of oil, the pressure applied to the pedal being thus conveyed to the brake mechanism. Visitors to the show may satiate their curiosity regarding this new device on Stand No. 128 (Hill and Boll). Further information may be obtained from the Weight Patent Brake Company (Limited), Lockwell Works, Bristol.

WESTERN MAIL. WEDNESDAY. NOVEMBER 9. 1910.

Confirmed by Grace's Guide, in 1910 Hill and Boll displayed the "weight" hydraulic brake system at the 1910 Motor Show, which applied the brakes to all four wheels of the car:

"Mention should not be omitted of the "weight" hydraulic brake system shown on the stand of Messrs. Hill and Boll. In this mechanism the brakes are applied to all four wheels of the car. The fluid is contained in a small reservoir to which are attached two small pistons. This part of the apparatus is attached to the chassis under the footboards, and is directly under the foot brake pedal. The two cylinders referred to are in their turn connected by means of steel tubes to four smaller cylinders placed inside the brake drums of the wheels. One of these cylinders supplies motive power to the front brakes and the other to the rear brakes. The two pistons are connected directly to the foot pedal, and as the whole system is full of oil or other liquid

a depression of the pedal causes the plungers in the brake cylinders to be forced out equally, and thus apply the brake blocks. The whole device is simple, and has the advantage of giving equal retarding pressures on all wheels."

MOTORS AT OLYMPIA.

COVERED TWO-SEATERS.

NOTABLE EXHIBITS.

By H. C. LAFONE.

GLOBE, THURSDAY, NOVEMBER 10, 1910

HILL AND BOLL.

Without a doubt the small coupé body which appeals to me most strongly is that displayed on a 12-h.p. Metallurgique chassis on the stand of Messrs. Hill and Boll, the well-known coach builders, of Yeovil. It is a thoroughly sound carriage maker's job, and has the marked advantage over the great majority of its rivals in that the side pillars for the wind screen fold forward and downwards when the wind-screen is not required. At first sight the top of the body would appear to be too low for comfort, and this is, in fact, the case at the moment at which the passenger is stepping in, but once inside it will be found that the seats themselves are so low that when the occupants are sitting down there is ample clearance between their heads and the top of the hood. A point which will appeal to many is the very great width of the side doors to this body. Personally, I think that a smarter appearance could be given to the front of this coachwork, by relieving, by means of curves, the flatness of the dashboard, but this could quite easily be effected without in any way interfering with the essential features of design.

OIL BRAKES.

Another interesting exhibit on Messrs. Hill and Boll's stand is the oil-pressure-actuated brakes invented by the Weight Patent Brakes, Ltd., of Bristol. This device, which is equally applicable either to front or back brakes, consists of internal expanding shoes, which are forced outwards by oil pressure exerted by means of a foot pedal which operates pistons in small cylinders full of oil. From these cylinders pipes are led to other cylinders situated in the rigid portion of the brake mechanism attached to the axles themselves. The braking action should certainly be very sweet and positive, and there is, of course, no tendency for the oil to become heated. This is quite a new departure, for which there should be a distinct future, particularly in view of the fact that it is applicable to front wheels.

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Weight referenced in 1910-11:
In 1911 the Autocar reported on the Weight front wheel braking system p329
And 1910-11 Brake Operation, Weight Patent Automatic System of, 485
1911 (Part 1) The Autocar: Index — Hydraulic, Weight, 329 Braking, Back and Front Wheel, 180

Colonial conditions.

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SCOTSMAN, THURSDAY, NOVEMBER 10, 1910.

One of the most important and practical features of the show is the Weight Patent Brake, which is an ingenious application

THE METALLURGIQUE EXHIBIT.

of the well-known hydraulic principle. The medium used is oil, which is contained in a small tank behind the brake pedal. This operates two pistons, one of which conveys the oil through steel pipes to the back pair of brakes, and the other to the front pair. By this means the driver is able to exert any amount of brake power upon all four wheels simultaneously by simple foot pressure. The brakes are of the internal expansion type, and each pair of shoes is expanded against the drums by a small piston, into which the oil is forced. The play necessary in the pipes for the rise and fall of the axles and for the turning of the front wheels in steering is furnished by oil-tight swivel joints. The great advantage of the system is the perfect compensation attained between each pair of brakes, which has been found particularly necessary in the case of front wheel brakes to prevent deflection of the steering. Another advantage is that there is a total absence of rattle and harshness of application, so that the quickest possible stoppages can be effected without any jerking or undue strain on the chassis. Furthermore, all the brake power is exerted direct on the wheels, and there is no strain whatever on the transmission, as is the case with the ordinary foot brake on the cardan head, which is the one mostly used by the driver. Where the Weight Patent Brakes are fitted the side lever is disconnected from the back wheel brake and is connected up to the cardan head brake, which is then only used for emergencies or for holding the car when standing still. So far we have only had a short run on the car fitted with these brakes, but it has been sufficient to demonstrate their efficiency, which we venture to state is far in advance of any other brake power hitherto applied to automobiles of any sort. So great is the initial safety, both as regards side slip and stopping power, that at least one insurance company is already allowing 10 per cent. rebate on all cars so fitted. We shall be making more extended trials, especially when we have the brakes on our own car, and will then go fully into details of the various tests which we propose to make. Working models and the full-size brakes are to be seen on the stand of Hill and Boll, Yeovil, in the annexe, who also show some interesting examples of two and four seated inclosed bodies with plenty of width and low, comfortable seats.

[illegible] and Co., the old-established London firm of

THE FIELD, THE COUNTRY GENTLEMAN'S NEWSPAPER. Nov. 12, 1910.

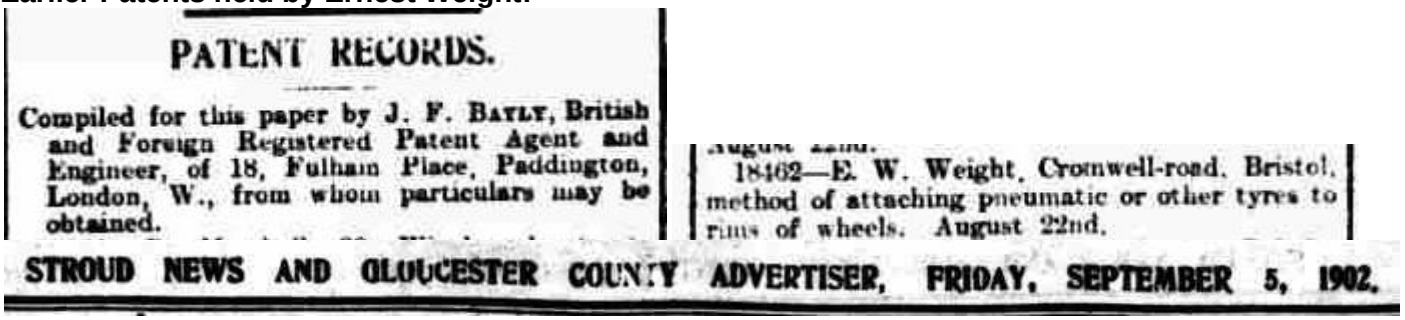
METALLURGIQUE EXHIBIT. One of the most important and practical features of the show is the Weight Patent Brake, which is an ingenious application of the well-known hydraulic principle. The medium used is

oil, which is contained in a small tank behind the brake pedal. This operates two pistons, one of which conveys the oil through steel pipes to the back pair of brakes, and the other to the front pair. By this means the driver is able to exert any amount of brake power upon all four wheels simultaneously by simple foot pressure. The brakes are of the internal expansion type, and each pair of shoes is expanded against the drums by a small piston, into which the oil is forced. The play necessary in the pipes for the rise and fall of the axles and for the turning of the front wheels in steering is furnished by oil tight swivel joints. The great advantage of the system is the perfect compensation attained between each pair of brakes, which has been found particularly necessary in the case of front wheel brakes to prevent deflection of the steering. Another advantage is that there is a total absence of rattle and harshness of application, so that the quickest possible stoppages can be effected without any jerking or undue strain on the chassis. Furthermore, all the brake power is exerted direct on the wheels, and there is no strain whatever the transmission, as is the case with the ordinary foot brake on the cardan head, which is the one mostly used by the driver. Where the Weight Patent Brakes are fitted, the side lever is disconnected from the back wheel brake and is connected up to the cardan head brake, which is then only used for emergencies or for holding the car when standing still. So far we have only had a short run on the car fitted with these brakes, but it has been sufficient to demonstrate their efficiency, which we venture to state is far in advance of any other brake power hitherto applied to automobiles of any sort. So great is the initial safety, both as regards side slip and stopping power, that at least one insurance company is already allowing a 10 per cent, rebate on all cars so fitted. We shall be making more extended trials, especially when we have the brakes on our own ear, and will then go fully into details of the various tests which we propose to make. Working models and the full size brakes are to be seen on the stand of Hill and Boll, Yeovil, in the annexe, who also show some interesting examples of two and four seated enclosed bodies with plenty of width and low, comfortable seats.

Seen also at the London Olympia Motor Show in November 1910, a 12-hp Argyll car with pedal-operated front brakes and lever-operated rear brakes was displayed. At the 1912 London Show, Argyll introduced a 15 hp car with brakes on all four wheels simultaneously operated by either pedal or lever at the choice of the driver. This mechanical system (by Perrot?) was patented in the United States on 21 October 1913. By 1925, more than fifty car brands around the world were using the principles of this braking system.

However, even in 1922 Americans auto engineers were still debating the safety of four-wheel braking. Only Duesenberg seemed confident enough in braking the front wheels to fit them linked all round.

Earlier Patents held by Ernest Weight:

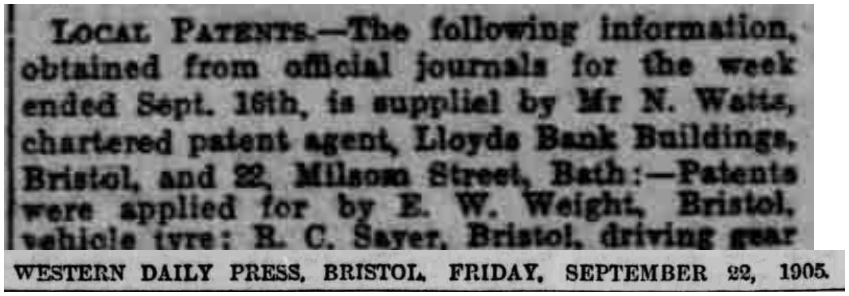


PATENT RECORDS.

Compiled for this paper by J. F. Bayly, British and Foreign Registered Patent Agent and Engineer, of 18, Fulham Place, Paddington, London, W., from whom particulars may be obtained.

18462—E. W. Weight, Cromwell-road, Bristol, method of attaching pneumatic or other tyres to rims of wheels. August 22nd.

STROUD NEWS AND GLOUCESTER COUNTY ADVERTISER, FRIDAY, SEPTEMBER 5, 1902.



Local Patents.—The following information, obtained from official journals for the week ended Sept. 16th, is supplied by Mr N. Watts, chartered patent agent, Lloyds Bank Buildings, Bristol, and 22, Milsom Street, Bath:—Patents were applied for by E. W. Weight, Bristol, vehicle tyre; R. C. Sayer, Bristol, driving gear

WESTERN DAILY PRESS, BRISTOL, FRIDAY, SEPTEMBER 22, 1905.

From Grace's: Guide for the Engineer of the 1910 Motor Show; Held from 4th to 12th November at Olympia: "MOTOR CAR EXHIBITION AT OLYMPIA.

Mention should not be omitted of the "weight" hydraulic brake system shown on the stand of Messrs. Hill and Boll. In this mechanism the brakes are applied to all four wheels of the car. The fluid is contained in a small reservoir to which are attached two small pistons. This part of the apparatus is attached to the chassis under the footboards, and is directly under the foot brake pedal. The two cylinders referred to are in their turn connected by means of steel tubes to four smaller cylinders placed inside the brake drums of the wheels. One of these cylinders supplies motive power to the front brakes and the other to the rear brakes. The two pistons are connected directly to the foot pedal, and as the whole system is full of oil or other liquid a depression of the pedal causes the plungers in the brake cylinders to be forced out equally, and thus apply the brake blocks. The whole device is simple, and has the advantage of giving equal retarding pressures on all wheels."

<u>Last news item found mentioning Weight Brakes 1911</u>:

The incident proved the safety of a low-built body, for it is quite certain that any ordinary car would have overturned and caused a fearful smash. Such emergencies happen to the most careful driver, for he cannot control the carelessness of others, and therefore he must make his car as safe and controllable as possible. In this case I achieved a sudden turn at right-angles when going nearly thirty miles an hour on a straight and apparently clear road. If I had had the new Weight brakes, acting on all four wheels at once by oil pressure from the brake pedal, I could have checked the speed sufficiently to avoid the ditch. I described this valuable invention in the Olympia Show report, and much regretted there was no time to get them fitted for this trip. There is no time to use a hand brake on such occasions, but the feet instinctively go down on clutch and brake pedals, both hands being busy with the steering. The same thing applies on difficult mountain roads, as I found later in the Cevennes and Italian ranges, where a smooth and even braking of all four wheels simultaneously would greatly increase the margin of safety.

BASIL CRUMP. FIELD, Feb. 18, 1911.-

<u>Company Information</u>: Company No: 106643; Weight Patent Automobile Brakes Ltd. Incorporated in 1909. Dissolved between 1916 and 1932 (ref BT 31/19152/106643). According to the Bristol Museum Service records, the Weigh Patent Brake Company retained its office address in Bristol, that of Featherston-Witty's companies, until 1924 but was definitely gone by 1936.

Other relevant hydraulic patents:

Heath's Hydraulic Brake Patents from 1904:

NEW INVENTIONS.

Specially compiled by Mr. George Barber, F.C.I.P.A. patent agent, Birmingham.

Improvements in pulleys—A. L. Kendrick, Balsall Heath. Electric automatic alarm letter box opening—D. P. Corbett and W. H. Hughes, Kidderminster. Improvements in and relating to clutch and back pedalling brake mechanism for driving wheels of bicycles and the like—F. E. Baker, Coventry. Improvements in radiators and condensers and the like—W. J. Wood, Coventry. Improved flexible hydraulic tubing—F. G. Heath and the Heath Hydraulic Brake Co., Ltd., Redditch. Improvements in hydraulic actuated brakes for cycles and motors—F. G. Heath and the Heath Hydraulic Brake Co., Ltd., Redditch. An improved method of rolling tubes and apparatus therefor—W. S. Smith, Erdington. A axle for bassinettes or other light vehicles—S. Cantrill, Birmingham. Improvements in internal combustion engines and means for governing same—J. B. Bowen, Coventry. A bottle cork holder for all corks when in use—C. Berron, Smethwick.

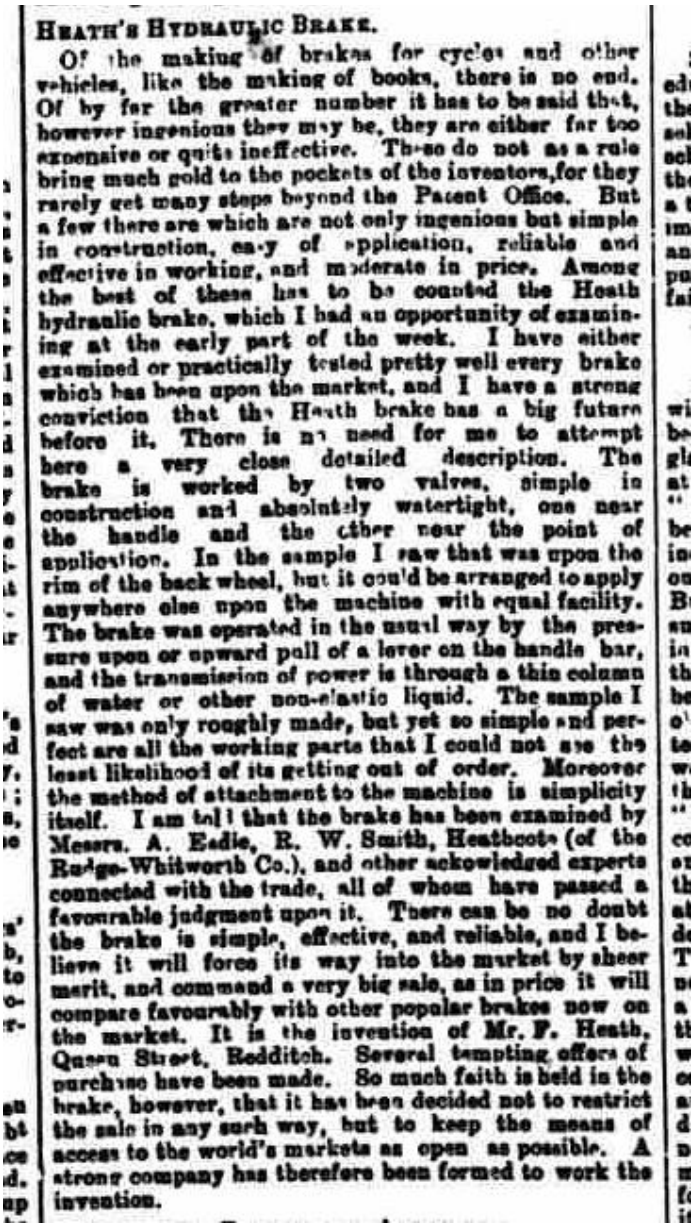
ALCESTER CHRONICLE SATURDAY. OCTOBER 22. 1904.

Improved flexible hydraulic tubing - F. G. Heath and the Heath Hydraulic Brake Co., Ltd., Redditch. Improvements in hydraulic actuated brakes for cycles and motors—P. G. Heath and the Heath Hydraulic Brake Co., Ltd., Redditch.

Application events:1904-02-13
Application filed by Frederick George Heath: 1904-02-13
Priority to GB190403651T: 1904-05-26
Application granted: 1904-05-26
Publication of GB190403651A:
Status: Expired

Improvements in Hydraulic Brakes for Cycles and Motor Vehicles

Abstract: 3651. Heath, F. G. Feb. 13. Brakes.-In a hydraulic brake for motor and other cycles, a cylinder B in the handle-bar C communicates, by means of a metal, gutta-percha, or other tubing H, with the bottom of a similar cylinder B' from which the brake blocks are operated. The cylinders and tubing contain water, to which some glycerine &c. has been added. A ring or cup D of india-rubber or other material protrudes from the cupped end of the piston A and receives a metal hemisphere E, which spreads the cup against the cylinder when pressure is exerted on its flat face, and so prevents leakage. If the piston is loose in the handle-bar, a split tube g<1>, with bayonet slots g<2> to take lugs on the cylinder, is provided. A lever f<1>, pivoted in an extension of the tube g', is adapted to be engaged by the bent end of the hand-lever F to force the piston into the cylinder. A bell-crank lever is sometimes used instead of the lever f<1>. In a modification, the inner end f<3>, Fig. 3, of the lever F presses on the piston when its other end is pressed down. The cylinder B<1> is secured to the framing by a clip, Fig. 6, to which it is brazed. A loop L, connected to the piston A' is attached to the yoke M carrying the blocks J. Release springs N are attached to the piston and cylinder. The cylinder B' may be adapted to operate a band

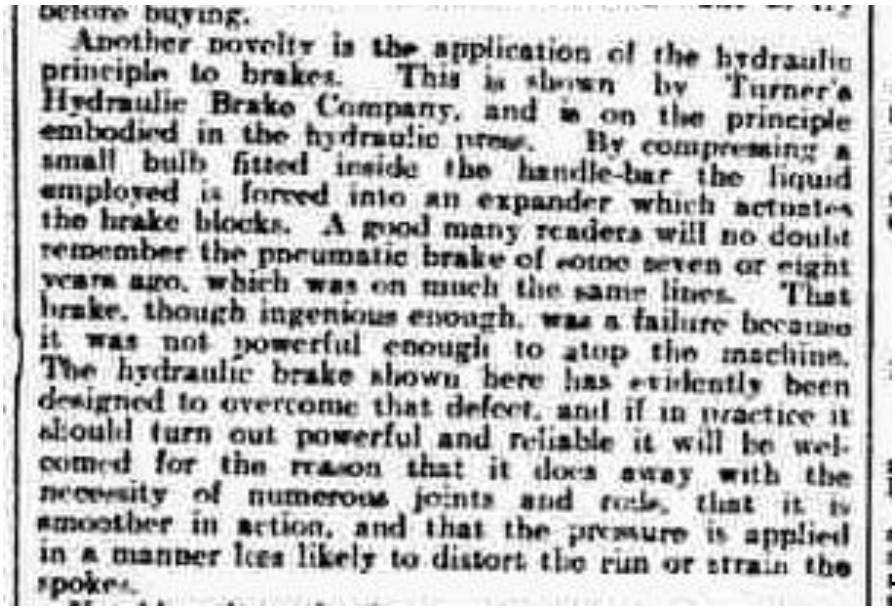


HEATH'S HYDRAULIC BRAKE.

Of the making of brakes for cycles and other vehicles, like the making of books, there is no end. Of by far the greater number it has to be said that, however ingenious they may be, they are either far too expensive or quite ineffective. These do not as a rule bring much gold to the pockets of the inventors, for they rarely get many steps beyond the Patent Office. But a few there are which are not only ingenious but simple in construction, easy of application, reliable and effective in working, and moderate in price. Among the best of these has to be counted the Heath hydraulic brake, which I had an opportunity of examining at the early part of the week. I have either examined or practically tested pretty well every brake which has been upon the market, and I have a strong conviction that the Heath brake has a big future before it. There is no need for me to attempt here a very close detailed description. The brake is worked by two valves, simple in construction and absolutely watertight, one near the handle and the other near the point of application. In the sample I saw that was upon the rim of the back wheel, but it could be arranged to apply anywhere else upon the machine with equal facility. The brake was operated in the usual way by the pressure upon or upward pull of a lever on the handle bar, and the transmission of power is through a thin column of water or other non-elastic liquid. The sample I saw was only roughly made, but yet so simple and perfect are all the working parts that I could not see the least likelihood of its getting out of order. Moreover the method of attachment to the machine is simplicity itself. I am told that the brake has been examined by Messrs. A. Eadie, R. W. Smith, Heathcote (of the Rudge-Whitworth Co.), and other ackowledged experts connected with the trade, all of whom have passed a favourable judgment upon it. There can be no doubt the brake is simple, effective, and reliable, and I believe it will force its way into the market by sheer merit, and command a very big sale, as in price it will compare favourably with other popular brakes now on the market. It is the invention of Mr. F. Heath, Queen Street, Redditch. Several tempting offers of purchase have been made. So much faith is held in the brake, however, that it has been decided not to restrict the sale in any such way, but to keep the means of access to the world's markets as open as possible. A strong company has therefore been formed to work the invention.

Cycling and Motoring section

ALCESTER CHRONICLE SATURDAY. APRIL 30. 1904.



before buying.

Another novelty is the application of the hydraulic principle to brakes. This is shown by Turner's Hydraulic Brake Company, and is on the principle embodied in the hydraulic press. By compressing a small bulb fitted inside the handle-bar the liquid employed is forced into an expander which actuates the brake blocks. A good many readers will no doubt remember the pneumatic brake of some seven or eight years ago, which was on much the same lines. That brake, though ingenious enough, was a failure because it was not powerful enough to stop the machine. The hydraulic brake shown here has evidently been designed to overcome that defect, and if in practice it should turn out powerful and reliable it will be welcomed for the reason that it does away with the necessity of numerous joints and rods, that it is smoother in action, and that the pressure is applied in a manner less likely to distort the rim or strain the spokes.

Turner's Patent, also for bikes.

YORKSHIRE POST. SATURDAY. NOVEMBER 19. 1904.

F. G. Heath and the Heath Hydraulic Brake Co., Ltd., Redditch.—Hydraulic actuated cycle brakes: In the construction of a plunger according to this invention, the rubber cylinder is made with a groove on its periphery, one being preferable. The cylinder is cupped at one extremity and to the other is secured a screwed shank, the cylinder being formed upon the shank head. In the groove upon the periphery of the cylinder an expansible piston ring is provided.

1905

COVENTRY HERALD AND FREE PRESS, SEPTEMBER 8, 190?

Not terribly relevant as post 1911 but who was C. Primavesi? He also had hydraulic brake work patented for cars.

RECENT PATENTS OF LOCAL INTEREST.

No. 28904.—C. Primavesi. Hydraulic brake for motor cars.
No. 28983.—G. T. Fairbrother. Means for pre

MIDLAND DAILY TELEGRAPH, TUESDAY, DECEMBER 31, 1912.

Carl Primavesi also got a patent in 1912 for hydraulic power assistance.

The contentiousness of front-wheel/four-wheel braking and hence, why the Weights might have had a marketing problem.

As an example of those who embraced early mechanical front wheel brake technology was Crossley, although they later ditched it until after WWI, as did Argyll and Arrol Johnston, note this from **Bristol Times and Mirror - Saturday 05 November 1910**: "The Crossley car factory which is entirely separate from the Crossley works for making stationary engines is in its way a model of what a motor factory should be, and the Crossley cars to be seen on Stand No. 129 are well worthy of their birth-place. When the principle of front wheel brakes was first mooted as a valuable but hardly practicable adjunct to a motor-car, Messrs. Crossley quickly overcame mechanical difficulties of their use and produced cars with brakes to every wheel, thus making a skid on a Crossley car an impossibility. The latest models of these brakes shown at Olympia on the exhibit are completely independent of the steering, and do not affect the control of the oar, however badly used."

Concerns about the stresses set up in front suspension by use of front-wheel brakes:

BRAKE EFFICIENCY.

The question of front brakes versus rear brakes is gradually becoming a matter of serious discussion. Upon a down grade the weight of a car is thrown forward on the front wheels, and the steeper the grade and the greater the speed the more will this be the case, writes Mr. Sturmey in the *Motor*, so that it is manifest that the efficiency of the brakes on the front wheels is likely to exceed that of those fitted on the rear ones. The actual stresses put upon the parts of the car, he thinks, are less with rear brakes than with front ones, partly by reason of the fact of the slightly less efficiency of rear brakes, but mainly because the braking of the rear wheels results in only tensional stresses upon the frame and springs. When the rear wheels are braked, they practically hang back and pull against the momentum of the car through the forward ends of the rear springs, by which they are anchored to the frame. When the brake power is applied to the front wheels, there is the same hanging-back action, so far as the axle and wheels are concerned, and the same tensional stresses upon the forward ends of the front springs, but there are strong compressional stresses set up throughout the frame members, the entire momentum of the car crowding up against the pins at the extremity of the forward dumb irons to which the front wheels are anchored.

DARTMOUTH AND SOUTH HAMS CHRONICLE, FRIDAY, FEBRUARY 25 1910.

The Weight Patent Automobile Brake Company Ltd. *David Grimstead, Melksham, March 2021*

Wikipedia "Hydraulic Brakes" page (https://en.wikipedia.org/wiki/Hydraulic_brake) amended W/E 27/11/2020, with this addition ahead of the original Loughhead only entry:

"During 1904, Frederick George Heath (Heath Hydraulic Brake Co., Ltd.), Redditch, England devised and fitted a hydraulic (water/glycerine) brake system to a cycle using a handlebar lever and piston. He obtained patent GB190403651A for "Improvements in hydraulic actuated brakes for cycles and motors", as well as subsequently for improved flexible rubber hydraulic pipes."

"In 1908, Ernest Walter Weight of Bristol, England devised and fitted a four-wheel hydraulic (oil) braking system to a motor car. He patented it in Great Britain (GB190800241A) in December 1908, later in Europe and the USA and then exhibited it at the 1909 London Motor Show. His brother, William Herbert Weight improved the patent (GB190921122A) and both were assigned to the Weight Patent Automobile Brake Ltd. of 23 Bridge Street, Bristol when it was established in 1909/10. The company, which had a factory at Luckwell Lane, Bristol, installed a four-wheel hydraulic braking system on a Metallurgique chassis, fitted with a Hill and Boll body, which was exhibited at the November 1910 London Motor Show. Although more cars had the brake system installed and the company advertised heavily, it disappeared without achieving the success it deserved."

(Original History Section entries: Loughead (who later changed the spelling of his name to Lockheed) invented hydraulic brakes, which he would go on to patent in 1917.[2][3] "Lockheed" is a common term for brake fluid in France.
Fred Duesenberg used Lockheed Corporation hydraulic brakes on his 1914 racing cars[4] and his car company, Duesenberg, was the first to use the technology on the Duesenberg Model A in 1921.
Knox Motors Company of Springfield, MA was equipping its tractors with hydraulic brakes, beginning in 1915.[5]
The technology was carried forward in automotive use and eventually led to the introduction of the self-energizing hydraulic drum brake system (Edward Bishop Boughton, London England, June 28, 1927) which is still in use today.)

MALCOLM LOUGHEAD: Some details found about Loughhead, none of which undermine the reality that the Weights designed and installed 4-wheel hydraulic brakes before Loughhead patented them, even "invented" them:

An American website forum (address below) which details hydraulic brake development has an entry by "Marontar" saying Malcolm Loughhead was developing hydraulic brakes in 1901 but there seems nothing formally recorded to prove that and **Malcolm Loughead (1886-1958) was only 15 that year and did not start working in the car industry until he was 18 in 1904...** He certainly did not get a patent until well into the 1914-18 War.

https://forums.aaca.org/topic/77546-early-automobile-brakes-1918-to-1942/
"In 1901 a young inventor named Malcolm Lougheed (who later changed the spelling of his name to Lockheed) began design work on a four-wheel hydraulic brake system for the automobiles as they begin to appear on the scene.
He used a large cylinder and hollow tubes to transmit fluid pressure through individual cylinders at each wheel. Each wheel cylinder pushed opposing brake shoes against the drums (Internal Expanding) or pulled strap linings around the outside of the drum (External Contracting).
Between December 17, 1922 and July 1923 he received seven patents for his hydraulic brake designs. In 1923 he formed the Hydraulic Brake Company in Detroit, Michigan to manufacture his brakes.
In 1921, the first passenger car to be equipped with four-wheel hydraulic brakes was the Duesenberg.
Carmakers as a group were not quick to adopt Lockheed hydraulic brakes. The first Lockheed four-wheel hydraulic brakes appeared on Maxwell's higher priced Chalmers cars in the late fall of 1923."

An article by Mick Jeffs (http://www.leamingtonhistory.co.uk/wp-content/uploads/2016/06/Lockheed-Full-PDF-06-Jun-2016.pdf), covering AP Hydraulics Company, states:

Lockheed USA: Here we take a brief diversion to look at the history of Lockheed in the USA. In 1903 Flora James Loughead (a Scottish name) divorced from husband, John, and bought a fruit-growing ranch in the Santa Cruz Mountains in northern California, USA, where she brought up two sons, Allan (1889-1969) and Malcolm (1887-1958). She supplemented the family income by working as a journalist. Allan and Malcolm started by building flying machines and an exposition in 1915 was a big break for this business. Allan concentrated on the aircraft business but meanwhile **Malcolm Loughead developed and patented hydraulic brakes in 1918 and 1919** and Malcolm and Allan went on to establish the Lockheed Corporation. However, they did not change their individual names legally to Lockheed until 1934.

Another web article about the Loughheads/Lockheeds says that Malcolm worked for the White Steam car distributor from 1904 "**where he conceived and later patented the four-wheel hydraulic brake**". He did not leave the aircraft division to sell hydraulic brake systems until after WWI, perhaps 1921.
(https://www.airforcemag.com/PDF/MagazineArchive/Documents/2006/August%202006/0806lockheed.pdf
)

It is notable that no motoring writer in British newspapers in 1908 to 1911 appears to mention that an inventor in the USA had already developed hydraulic brakes, even though American cars and their manufacturers were commonly reported upon, due to their competitiveness and innovation.