

MAIDENHEAD, 297.

EDMOND E. JOHNSON,  
MAESCOURT,  
MAIDENHEAD,  
BERKS.

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,

REFERENCE.

ASCOT,

J/MW.

BERKS.

Mon:1:May:22.

Dear Captain Crossley Meates,

I am taking the liberty of asking Messrs Rolls-Royce to send the Exhaust Manifold and Half Clip, carriage paid, direct to your address as per accompanying copy letter.

The 2nd and 3rd Edition of the Pamphlet are being placed in the Printers hands to-day.

I have made an approximate estimate of the H.P. required to operate the B.E.2.C. Fuselage, and enclose a copy of my Calculations for your perusal. My opinion is that the 75 H.P. Rolls-Royce Engine will supply from 2 to 3 times the power necessary to attain a speed of 100 M.P.H., however, perhaps you will go through my figures to ascertain if I have left anything out of my calculations. The estimated weights given in the absence of further corroborations must however be looked upon as very approximate.

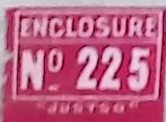
I am sending you under separate cover Tracing of B.E.2.C. Fuselage with Track Wheels enlarged to 18 inches diameter as suggested. At 100 M.P.H. these Wheels would revolve at 933 R.P.M., while if the Pilot Wheels are 1 ft. in diameter they would operate at 1400 R.P.M.

If it were possible it would greatly simplify matters to run the Demonstration Car with double flanged Wheels. The introduction of the Pilot Wheels would only reduce Rolling friction by about 5%; the Rolling friction, however, as you will see is only a very small item.

I have indicated one pair of Aerofoils as I presume that for the Demonstration Car 2 pairs will be unnecessary.

Yours sincerely,

*Edmond E. Johnson.*



Copy of H.P. Calculations.  
Tracing of B.E.2.C. Fuselage (Under separate cover)



## B. E. 2. C Fuselage - Estimated H.P.

Speed - - - - - 100 M.P.H  
 Weight loaded (assumed) 1 Ton  
 Area of cross section of Car (say) 9 sq. ft.  
 Effective area involved - - - - -  $\frac{9}{4}$  sq. ft.  
 The co-efficient of air resistance is taken at . . . . . 0.032 lbs per sq. ft.  
 Total Air resistance  $R = .0032 \times \text{Eff area} \times V^2$  in M.P.H.  
 Air Resistance =  $.0032 \times \frac{9}{4} \times 100 \dots = 72$  lbs  
 Resistance to Rolling friction<sup>4</sup> on 1 Ton - - - = 3 "

TOTAL RESISTANCE  $R = \underline{75 \text{ lbs}}$

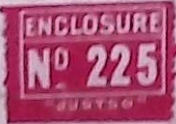
Velocity  $V$  in feet per Second =  $\frac{\text{Speed M.P.H} \times 5280}{60 \times 60} = \frac{100 \times 5280}{60 \times 60} = 146.7$

$H.P. = \frac{R \times V}{550} = \frac{75 \times 146.7}{550} = 20 H.P.$

Allowing an Efficiency of 75% for transmission the TOTAL Horse Power required to overcome 75 lbs RESISTANCE at 100 M.P.H =  $20 H.P. + 7 H.P. \dots = \underline{27 H.P.}$

<u>Estimated Weights (approximate)</u>	cwt.	qr.	lbs.
Weight of Fuselage with 90 R.A.F. Engine.	7.	1.	8.
Estimated weight of Water, Oil or Fuel.	2.	0.	0.
Estimated weight of Propeller.			25.
Estimated weight of Radiator.		2.	14.
Estimated weight of Aerofoils and Gear.	1.	2.	0.
Estimated weight of Bogies.	5.	0.	0.
Estimated weight of Passengers.	3.	0.	0.
	<u>19.</u>	<u>2.</u>	<u>19.</u>

Total Weight equals Say 1 Ton





Messrs Rolls-Royce, Ltd.,  
Nightingale Road,  
DERBY.

J/MW.

Mon:1:May:22.

Your Ref. D/BP/Y808/MH.

Dear Sirs,

I am in receipt of your letter of the 25th instant, and shall be glad if you will kindly despatch the following to me at the address given below:-

1. Exhaust Manifold to L.O.P. E16342.....	£14. 11. 6.
2. Half Clip Part No. E.9805 "Cap to Water Pipe Bracket".....	5. 6.
	<u>£14. 17. 0.</u>

I shall be glad if you will be good enough to pay the Carriage and consign same "Paid home" to :-

Edmond T. Johnson,  
C/o. Captain Crossley Meates,  
Barklands,  
ASCOT. BERKSHIRE.

Ascot is on the London South Western Railway.

I enclose you Cheque for the above amount.

Yours faithfully,

224. Cheque value £14. 17. 0. (Fourteen pounds seventeen shillings).



JOHNSON,  
VIA ESCOURT,  
MAIDENHEAD,  
BERKS.

Captain B. Crossley,  
Larklands,

REFERENCE.

J/MW.

ASCOT,

BERKS.

Tues: 2: May: 22.

Dear Captain Crossley Meates,

I have this day received a letter from H. Drury Lavin offering to return me my Deposit of £17, and threatening to take back the Rolls-Royce Engine.

I have, however, written him to-day, pointing out that a binding Contract exists and that I shall be quite ready to complete my portion of same as soon as the Engine is complete and perfect in accordance with the terms of the Contract.

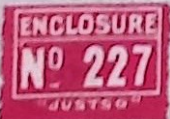
I am just writing to advise you should Lavin make application for the Engine not to part with it under any consideration whatever.

I enclose you copy of letter received from Waddon to-day. It would appear from this letter that they have sold all the B.E.2.C. Fuselages and now only have left B.E.2.E. I am, however, asking the A.D.C. Ltd., to let me know if they can offer me a B.E.2.C. Fuselage from any of their other Depots.

I expect the 3rd Edition of the Pamphlet will be printed by the early part of next week, so that I should like to arrange an appointment with Sir Eric Geddes next week, if this would be convenient to you, and if I knew his address I see no reason why I could not fix up an appointment without any introduction whatsoever. Certainly if I can fix up an appointment, and let the Mono-Railway stand entirely on its own merits, I should be better pleased. The only advantage of an introduction in a case of this kind, is that it saves ~~the~~ trouble in arranging an appointment in the first instance; beyond this my experience has been that in 9 cases out of 10 introductions do more harm than good.

Yours sincerely,

*Edmund G. Johnson*



Copy of letter from A.D.C. Ltd., Waddon, dated the 1st inst.,



( C O P Y )

Aircraft Dispos  
Aircraft Depot,  
Waddon,  
CROYDON.

1st. May, 1922.

Edmond E. Johnson, Esq.,  
Maescourt,  
Maidenhead,  
BERKS.

Dear Sir,

With reference to your letter of the 26th ulto.,  
reference J/MW., the only fuselages which we have now  
available are two B.E.2.e. You could have either of these  
for about £10., but minus undercarriages which have been sold  
since you were last in communication with us. If you called  
at this Depot, you could examine what we have left and settle a  
price on the spot.

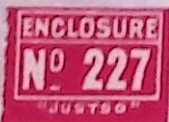
Yours faithfully,

For and on behalf of THE AIRCRAFT DISPOSAL CO., LTD.

(sgd) JR. Grant,

SUPERINTENDANT.

JRG/MMcR.





Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,  
MAESCOURT,  
MAIDENHEAD,  
BERKS.

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,

ASCOT,

REFERENCE.

J/MW.

BERKS.

Mon:8:May:22.

Dear Captain Crossley Meates,

Rolls-Royce Ltd., have now given me a further reply about the Lubrication for the "Hawk" Engine, and I will bring on Wednesday a sheet of particulars compiled from this and previous letters.

Dealing with the H.P. Calculations sent you on the 1st instant, I note by your phone message that you query the figure taken for Rolling Friction at 3 lbs per Ton.

In order that you may see how I have arrived at this result, I enclose you particulars of the various authorities upon the subject.

For the Mono-Railway, the power given at 100 M.P.H. against a Resistance of 75 lbs was 27 H.P. If the same calculations were applied to the Twin Rail System, then the power given at 100 M.P.H. against a Resistance of 92 lbs would be 32.7 H.P., representing a difference of about  $5\frac{3}{4}$  H.P., which would be a small item compared to the reserve of power held in hand.

The 3rd Edition of the Pamphlet should be completed this week, and I must therefore try and fix an appointment, if convenient to you, for next week with :-

Sir Eric Geddes. G.C.B., C.B.E.  
12A Manchester Square, W.1.  
Windham Club, St. James Square.  
Marlborough Club, Pall Mall.

(Inspector in Charge of Government Scrap)

I have been advised by Mr. Charles Barron to keep clear of all Public Railways for my Demonstrations, otherwise the Demonstration Car would have to pass the Board of Trade before it could be run. I have also been advised by him to steer clear of that Department in the Board of Trade which renders assistance to Inventors, the position being that if the trials turned out a failure, the Government would pay the expenses and there the matter



Captain Crossley Meates.

Mon:8:May:22.

would end, on the other hand if they turned out a success, the Mono-Rail would then become a Government Monopoly

Mr. Barron suggests that the proper course to take would be to approach the owners of Private disused railway lines; the following are a few of the names which have been furnished:-

1. Llanelly (Carmarthern)  
About 12 miles of single Track. Plenty of Gradients and Curves.
2. Carlisle, Newcastle and Brampton. 15 to 20 Miles of single Flat Track.
3. Greta - Filling Factory.  
A good run of Flat Track.
4. Marden to Tenterton - Kent.  
A good run of Flat Track.
5. Furness Line - Sidings.

Mr. Charles Barron says that I can have Government Flat Bottom Rail at £5 per ton, and that he would through in the Spikes, to fix, free of charge.

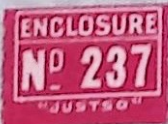
3 Miles of (26 lb per yard) Flat bottom Rails @ £5 Ton  
 works out at £222 per Mile .....£2666  
 (A gang of 6 men @ 10/- per Man per Day should  
 lay 1 Mile in 3 days)  
 Laying 3 miles of Mono-Rail @ £9 per Mile 27

£693.

NOTE

When the Rails are finished with they can be cut in 5 ft lengths and sold as scrap at £5.10. 0 to £6. 10. 0. per Ton, so that it would only mean a matter of Capital outlay for the Demonstrations, after which time the bulk of the Capital would be realised, assuming that Fish Plates can be used (which means no Pilot Wheels-) and that I can get a Private owner to let me have the use of his line for nothing. It is here where Sir Eric Geddes might be of some use, because if he would give me an introduction to a Private Owner of a disused Railway Line, it might carry sufficient weight to accomplish this end, on the other hand these arrangements might be made independantly of him, the only advantage that I can see in interviewing him at the present stage is that it might be an asset if he became interested at the outset.

Yours sincerely,  
*Edmond E. Johnson*



Tracing of 26 lb Rail (Approximate Section)  
Rolling Friction Calculations.



ne: MAIDENHEAD, 297.

**EDMOND E. JOHNSON,**  
**MAESCOURT,**  
**MAIDENHEAD,**  
**BERKS.**

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,

REFERENCE.

J/MW.

ASCOT,

BERKS.

Wed: 7: June: 22.

Dear Captain Crossley Meates,

Many thanks for your letter. After the worst Motor trip I ever had in my life I landed back with the Fuselage, but without the Martini on Sunday at 5 p.m., after having spend  $2\frac{1}{2}$  days and 2 nights on the road from Waddon here.

I did as you suggested and visited every Garage at Kingston, but could not get a Magneto, so was compelled to leave the Car at Sunbury Motor & Cycle Co., Sunbury Common, while the Magneto has gone to the B.T.H. to have the Armature re-wound. I hired a Motor to get the Fuselage here from Sunbury Common. The 200 H.P. Sunbeam Arab Radiator and the Stand for the "Hawk" Engine are still in the Martini at Sunbury.

The enclosed letter from Rolls-Royce Ltd., arrived this morning. I am not quite sure what the missing pipes are, but if they can supply them now I should be entitled to deduct the cost thereof from Drury Lavin's account. I also enclose 2 previous letters from Rolls-Royce, concerning bearer brackets, and proposed call to examine "Hawk" Engine. Do not trouble, however, about this matter if you are over busy just now.

I cannot refer to the pipe work Drawing sent by Rolls-Royce, as I left this with you. I might add that to overcome the difficulty of the large diameter Outer Track Wheels, which in the case of the front Bogie interferes with the Aerofoils, I propose using smaller Track Wheels all of the same size, and introducing Track Wheel Drive in addition, in order to get quick acceleration with small Wheels, and facilitate starting on upward Gradients if necessary.

For the Dash I have purchased in addition to the Instruments thereon, a Stop Watch and Inclinator Level, also a Gradient Level, besides the Radiator Thermometer.

The Fuselage is now in my Garage, and I am removing the Joy Stick Gear, and suggest retaining the Rudder Foot Bars



Captain B. Crossley Meates, -2-

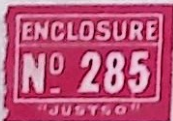
Wed:7:June:22.

for the purpose of controlling the angle of incidence of the Aerofoils. If this can be done it will save a lot of gear.

With kind regards to all.

Yours sincerely,

*Edmund E. Johnson*



Letters from Rolls-Royce dated May 31st, and the 1st and 6th instant.



ROLLS-ROYCE, LTD.

DERBY.

TELEGRAMS:  
"ROYCAR, DERBY."

TELEPHONES:  
DERBY 1320 (6 LINES)

YOUR REPLY PLEASE  
QUOTE

June 6th, 1922.

D/AWS6/B3.6.22.

Edmond E. Johnson Esq.,  
Maescourt,  
Maidenhead,  
Berks.

Dear Sir,

Spares for Hawk Engine.

With further reference to your letter of the 31st ultimo ref. J/MW, we beg to advise you that we are not quite clear which pipe you really require. You mention the sump and we think you refer to the Oil Pipe running from the Pump to the Sump.

Our price for this - piece No. E.12201A - is  
£1. 3. 0. each.

You also mention "Pipe passing between the 2 Half Clips to the sump" This is a water pipe - piece number E.16864. If this is the part you require the price is 8/- each.

The prices quoted herein are net, and include delivery to your address.

Terms:- Cash with order.

This quotation is subject to acceptance within 30 days.

Thanking you in anticipation of your kind instructions, and assuring you at all times of our best services,

We are,

Yours faithfully,  
FOR AND ON BEHALF OF

ROLLS-ROYCE, LIMITED.

*John De Moor*  
SECRETARY

PS. We beg to remind you that our Works are at present closed owing to the lock-out in the Engineering Industry.

ENCLOSURE  
No 285



ROLLS-ROYCE, LTD.

DERBY.

AMS:  
DERBY."  
IONS:  
O (6 LINES)  
EPLY PLEASE  
UOTE

D/BP/WH6/OG.

1st June, 1922.

Edmond E. Johnson Esq.,  
Maescourt,  
MAIDENHEAD,  
Berks.

Dear Sir,

We beg to acknowledge receipt of your letter of yesterday's date, the contents of which we have duly noted.

If at any time in the near future we happen to have a mechanic in the London district, we will communicate with you again. If on the other hand you desire us at any time to send a mechanic specially, no doubt you will let us know, and return the order form which was submitted on the 25th ulto.

With regard to the bearer brackets, we wrote you fully regarding these yesterday.

Our quotation for supplying a copper piping passing between the two half clips to the sump will be submitted in the course of a day or so.

Yours faithfully,

FOR AND ON BEHALF OF

ROLLS-ROYCE, LIMITED.

*John DeLooze*  
SECRETARY



ROLLS-ROYCE, LTD.

DERBY.

TELEGRAMS:  
"ROYCAR, DERBY."

TELEPHONES:  
DERBY 1320 (6 LINES)

YOUR REPLY PLEASE  
QUOTE

D/BP/WH11/OG.

31st May, 1922.

Edmond E. Johnson Esq.,  
Maescourt,  
Maidenhead,  
BERK S.

Dear Sir,

Further to our letter of yesterday's date  
D/BP/WH3/OG, and also in reply to yours of the 26th inst.,  
we regret to inform you that we have no Bearer Brackets  
in stock of the dimensions you require, and as shown on  
the blue print which we are returning herewith.

If you desire us to manufacture a set of  
brackets of these dimensions, we are afraid it would  
prove to be a very expensive matter, as it would mean  
producing patterns and casting the brackets. You will  
also understand that we could not make any promise of  
delivery owing to the prevailing circumstances, and also  
the fact that this is special work and would mean the  
preparation of entirely new drawings, and setting up the  
machinery specially for the production of same.

Yours faithfully,

FOR AND ON BEHALF OF

ROLLS-ROYCE, LIMITED.

*John R. Looze*  
SECRETARY.



MAIDENHEAD, 297.

MEMORANDUM.

MA ESCOULENTINSON,  
BERKS.

REFERENCE.

ASCOT,

J/MW.

BERKS.

Fri:23:June:22.

Dear Captain Crossley Meates,

The accompanying letter from Messrs Rolls-Royce Ltd., has come to hand this morning, and I enclose you letter and Order to Messrs Rolls-Royce, and shall be glad if you will be kind enough to post same after filling in the most convenient time for their Representative to call upon you.

I went to Sunbury yesterday to pick up my Car, but was unable to do so owing to failure in the lubrication system, otherwise I could let you have the Stand for the "Hawk" Engine, as this is still in my Car lying at the Sunbury Common Garage.

I already have an Aerofoil mounted on the Fuselage which can be operated either by hand from the Joy Stick, or by foot from the Rudder Foot Board, or both.

I propose using a 2H.P. Inspection Car petrol driven for the rear Bogie, however, I will not worry you with any details just now during Term time.

With best wishes.

Yours sincerely,

*Edmond E. Johnson*

P.S. For the Rolls-Royce appointment I presume a Saturday morning would suit you best.

ENCLOSURE  
No 310  
"JUSTSO"

1. Letter from Rolls-Royce, Ltd., dated the 22nd inst.
2. Letter, Order Form and stamped addressed Envelope to Rolls-Royce, Ltd.,
3. Railway Gazette Simplex adv.



Phone: MAIDENHEAD, 297.

**EDMOND E. JOHNSON,**  
**MAESCOURT,**  
**MAIDENHEAD,**  
**BERKS.**

MEMORANDUM.

Captain B. Crossley Meates,  
St. Bartholomew's Hospital,  
LONDON,

REFERENCE.

J/MV.

F.C.1.

Thur: 29: June: 22.

Dear Captain Crossley Meates,

On the 23rd instant I forwarded you a letter from Rolls-Royce Ltd., asking for an appointment to inspect "Hawk" Engine, together with suggested reply, and stamped Envelope addressed to Messrs Rolls-Royce, and I hope these have reached you safely.

I see by this morning's Daily Mail that it is possible that the Rolls-Royce Aero Works is to be closed down. I am, therefore, anxious to get the "Hawk" Engine complete before this takes place.

The work upon the Fuselage is proceeding, and it will soon be covered with Venesta 3 ply, 5.m.m. thick.

In regard to the Bogies I am negotiating with 2 Firms, The Simplex Works, Amsterdam, and The Drewry Car Co. Ltd., 13, South Place, E.C.2.

I am also negotiating for the Mono-Rail which I propose to erect upon Steel Joists. I also propose using Double Flanged Wheels for the Mono-Rail Track Wheels, dispensing with the Pilot Wheels, and in place thereof substituting Idler Wheels, which will make contact on the underside of the Joist Flanges, should bounding take place when a speed of 100 M.P.H. is approached.

In regard to the Track I have already commenced negotiations with a view to getting in touch with one or other of the following:-

Duke of Sutherland.  
Marquis of Londonderry.  
Duke of Northumberland.  
Duke of Portland.



Captain Crossley Meates. -2-

Thur:29:June:22.

all of whom own private Tracks on their Estates.

I hope to have the Martini next week, in which case I will, if convenient to you, run over with the wooden stand for the "Hawk" Engine.

With best wishes,

Yours sincerely,

*Edmund G. Johnson*

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P.S. You will be pleased to hear that the British Patent has now been finally accepted, and that I have got all my 9 Claims through intact, likewise the French Patent has gone through in a similar fashion. The American Patent, however, still hangs fire, Claims 1 and 2 being objected to.



Phone: MAIDENHEAD, 297.

**EDMOND E. JOHNSON,**  
**MAESCOURT,**  
**MAIDENHEAD,**  
**BERKS.**

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,  
ASCOT,  
BERKS.

REFERENCE.

J/MW.

Thur: 20: July: 22.

Dear Captain Crossley Meates,

I enclose you copy of the proposed Claims for the American Patent, the original Claims 1 and 2 having been abandoned and Claims 1 to 5 taking their place.

You will see original Claims 1 and 2 on Page 9 of the accompanying Specification dated 26/9/21.

Yours sincerely,

*Edmond E. Johnson*

*Hope to see you here on Sunday.*



Revised Claims  
Specification dated 26/9/21.



1. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting in a horizontal plane on either side of said body when in motion, said means comprising two aerofoils or cambered vanes mounted on vertical axes and arranged on either side of said body with their centres of pressure lying in the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, **adapted so as to vary the angle of incidence of each aerofoil or cambered vane, the angle of incidence of each aerofoil or cambered vane said means being controlled by lateral forces. and being controlled by said lateral forces.**

2. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting in a horizontal plane on either side of said body when in motion, said means comprising two aerofoils or cambered vanes mounted on vertical axes and arranged on either side of said body with their centres of pressure lying near the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, **adapted so as to vary the angle of incidence of each aerofoil or cambered vane, to vary the angle of incidence of each aerofoil or cambered vane said means being controlled by lateral forces. and being controlled by said lateral forces.**

3. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting in a horizontal plane on either side of said body when in motion, said means comprising a plurality of aerofoils or cambered vanes mounted on vertical axes and arranged in pairs on either side of said body in such positions that the



resultant centre of pressure lies in the transverse vertical and horizontal planes in which lies the centre of gravity - adapted so as to vary the angle of incidence of said vehicle, said means being adapted to vary the angle of each aerofoil or cambered, said means being controlled of incidence of each aerofoil or cambered vane and being by lateral forces. controlled by said lateral forces.

4. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting in a horizontal plane on either side of said body when in motion, said means comprising a plurality of aerofoils or cambered vanes mounted on vertical axes and arranged in pairs on either side of said body in such positions that the resultant centre of pressure lies near the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, said means being adapted to angle of incidence of each aerofoil or cambered vane, vary the angle of incidence of each aerofoil or cambered vane and said means being controlled by lateral forces. being controlled by said lateral forces.

5. In a monorail vehicle the combination with the body thereof of aerofoils or cambered vanes pivotally mounted on said body in substantially vertically planes, means controlled by the speed of the vehicle for varying the degree of the camber of said vanes, and means for determining on which side of a neutral plane the camber of each vane shall be varied, said second mentioned means being controlled by lateral forces.

6. In a monorail vehicle, the combination with the body thereof, of aerofoils or cambered vanes pivotally mounted on said body, the centres of pressure of said vanes



lying in or near the transverse vertical and horizontal planes in which lies the center of gravity of the vehicle, a servo-motor connected with said aerofoils or vanes for effecting a change of incidence thereof, a pendulum adapted under the influence of centrifugal action to control said servo-motor, an auxiliary servo-motor, adapted when operated to modify the action of the first mentioned servo-motor, and a pennant operable under the influence of lateral wind pressure to control said auxiliary servo-motor.

7. In a monorail vehicle, the combination with the body thereof, of aerofoils or cambered vanes pivotally mounted thereon, said vanes being so constructed that the camber thereof may be varied to one side or the other of a neutral position, servo-motors for varying the camber of said vanes and a diaphragm chamber for automatically controlling the amount of camber according to the speed of the vehicle, the diaphragm in said chamber being controlled by air pressure exerted thereon, through tubes connected with said chamber on each side of the diaphragm, one of said tubes being provided with a cowl, substantially as described.

8. In a monorail vehicle, the combination with the body portion thereof, of a plurality of aerofoils or cambered vanes, mounted on vertical axes, servo-motors for simultaneously varying the angle of incidence of said vanes, servo-motors for simultaneously varying the camber of said vanes and means for automatically controlling the operation



of said servomotors in accordance with lateral pressures of wind or centrifugal action on said monorail body to counteract the effect thereof.

9. In a monorail vehicle, the combination with the body portion thereof, of a plurality of aerofoils or cambered vanes, means for mounting said vanes for varying the angle of incidence thereof, means for varying the camber of said vanes on either side of a neutral position, servomotors for controlling the angle of incidence and camber respectively and means automatically controlled by lateral wind pressure and centrifugal action for controlling the action of said servo-motors, said servo-motor for varying the cambers of the vanes being also controlled by the speed of the vehicle.

10. Improved means for stabilizing moving bodies as claimed in Claim 2, wherein the variation of the angle of incidence of the aerofoils or cambered vanes is effected by means constructed, arranged, and adapted to operate substantially as hereinbefore set forth with reference to Figures 1, 2, 4, 5 and 6 of the accompanying drawing.

11. Improved means for stabilizing moving bodies as claimed in Claim 2, wherein the variation of the camber of the aerofoils or cambered vanes is effected by means constructed, arranged, and adapted to operate substantially as hereinbefore set forth with reference to Figures 1, 2, 3 and 7 of the accompanying drawings.



12. A monorail vehicle constructed and arranged substantially ~~for~~ as and for the purposes hereinbefore set forth with reference to the accompanying drawings.

13. Means for varying the camber of the wing of an aircraft, comprising a crank movable in one or more slotted blocks secured to the walls of a wing, said crank being operated by a servo-motor, which is controlled by movement of a diaphragm in a chamber into which chamber open on opposite sides of the diaphragm two forwardly projecting tubes the open end of one of which is covered by a cowl, substantially as set forth.



Phone: MAIDENHEAD, 297.

MEMORANDUM.

EDMOND E. JOHNSON,  
MAESCOURT,  
MAIDENHEAD,  
BERKS.

Captain B. Crossley Meates,  
Larkland s,  
ASCOT,  
BERKS.

REFERENCE.

J/MW.

Mon:7:Aug:"22.

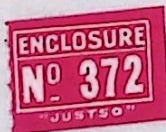
Dear Captain Crossley Meates,

I enclose copy of revised American Claims 1 to 13 together with copy of suggested reply to Clark, which I shall not post until I see you.

Hope to call to-morrow, Tuesday afternoon as arranged with you on the phone.

Yours sincerely.

*Edmond E. Johnson*



Copy of Revised American Claims.  
Copy of reply to A.M. & Wm. Clark.



(C O P Y)

Messrs A.M. & Wm. Clark,  
British, Foreign & Colonial  
Patent Agents,  
53 & 54, Chancery Lane

J/MW. LONDON. W.C.2

Tues:8:Aug:22.

U.S. Application Ser. No. 515217.

Dear Sirs,

Your letter of the 1st instant arrived during my absence in the north of England, hence the delay in replying to same.

Will the words "means adapted" be sufficient to satisfy the Examiner that the angle of incidence can be controlled by hand? This remark applies to Claims 1, 2, 3 and 4

Claim 9 should be changed to Claim 10, a new Claim 9 inserted to embody the control by hand, something to the following effect:-

New Claim 9. "In a monorail vehicle the combination with the body thereof of aerofoils or cambered vanes pivotally mounted on said body in substantially vertical planes, means for varying the degree (by hand) of the camber of said vanes according to the speed of the vehicle, and means for reversing the camber of each vane by hand."

Old Claim 10 should be subdivided into 2 Claims.

New Claim 11. "lying in the transverse vertical and horizontal planes etc."

New Claim 12. "lying near the transverse vertical and horizontal planes etc."

On Page 5 the word "wing" I presume should be "Wind".

Yours faithfully,



9/

1. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising two aerofoils or cambered vanes mounted on vertical axes and arranged on either side of said body with their centres of pressure lying in the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means adapted to vary the angle of incidence of each aerofoil or cambered vane.

2. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising two aerofoils or cambered vanes mounted on vertical axes and arranged on either side of said body with their centres of pressure lying near the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means adapted to vary the angle of incidence of each aerofoil or cambered vane.

3/

3. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said



means comprising a plurality of aerofoils or cambered vanes mounted on vertical axes and arranged in pairs on either side of said body in such positions that the resultant centre of pressure lies in the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means adapted to vary the angle of incidence of each aerofoil or cambered vane.

4. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising a plurality of aerofoils or cambered vanes mounted on vertical axes and arranged in pairs on either side of said body in such positions that the resultant centre of pressure lies near the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means adapted to vary the angle of incidence of each aerofoil or cambered vane.

5. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising two aerofoils or cambered vanes mounted on vertical axes and arranged on either side of said body with their centres of pressure lying



in the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means controlled by said lateral forces and adapted to vary the angle of incidence of each aerofoil or cambered vane.

6. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising two aerofoils or cambered canes mounted on vertical axes and arranged on either side of said body with their centres of pressure lying near the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means controlled by said lateral forces and adapted to vary the angle of incidence of each aerofoil or cambered vane.

7. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising a plurality of aerofoils or cambered vanes mounted on vertical axes and arranged in pairs on either side of said body in such positions that the resultant centre of pressure lies in the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means controlled by said lateral



forces and adapted to vary the angle of incidence of each aerofoil or cambered vane.

8. In a monorail vehicle the combination with the body thereof of means for neutralizing lateral forces acting on either side of said body when in motion, said means being adapted to exert in a horizontal plane on either side of said body when in motion, forces opposed to said lateral forces, said means comprising a plurality of aerofoils or cambered vanes mounted on vertical axes and arranged in pairs on either side of said body in such positions that the resultant centre of pressure lies near the transverse vertical and horizontal planes in which lies the centre of gravity of said vehicle, and means controlled by said lateral forces and adapted to vary the angle of incidence of each aerofoil or cambered vane.

9. In a monorail vehicle the combination with the body thereof of aerofoils or cambered vanes pivotally mounted on said body in substantially vertical planes, means controlled by the speed of the vehicle for varying the degree of the camber of said vanes, and means for determining on which side of a neutral plane the camber of each vane shall be varied, said second mentioned means being controlled by lateral forces.

10. In a monorail vehicle, the combination with the body thereof, of aerofoils or cambered vanes pivotally mounted on said body, the centres of pressure of said vanes lying in or near the transverse vertical and horizontal



planes in which lies the centre of gravity of the vehicle, a servo-motor connected with said aerofoils or vanes for effecting a change of incidence thereof, a pendulum adapted under the influence of centrifugal action to control said servo-motor, and auxiliary servo-motor, adapted when operated to modify the action of the first mentioned servo-motor, and a pennant operable under the influence of lateral wind pressure to control said auxiliary servo-motor.

11. In a monorail vehicle, the combination with the body thereof, of aerofoils or cambered vanes pivotally mounted thereon, said vanes being so constructed that the camber thereof may be varied to one side or the other of a neutral position, servo-motors for varying the camber of said vanes and a diaphragm chamber for automatically controlling the amount of camber according to the speed of the vehicle, the diaphragm in said chamber being controlled by air pressure exerted thereon, through tubes connected with said chamber on each side of the diaphragm, one of said tubes being provided with a cowl, substantially as described.

12. In a monorail vehicle, the combination with the body portion thereof, of a plurality of aerofoils or cambered vanes, mounted on vertical axes, servo-motors for simultaneously varying the angle of incidence of said vanes, servo-motors for simultaneously varying the camber of said vanes and means for automatically controlling the operation of said servo-motors in accordance with lateral pressures of wing or centrifugal action on said monorail body to



counteract the effect thereof.

13. In a monorail vehicle, the combination with the body portion thereof, of a plurality of aerofoils or cambered vanes, means for mounting said vanes for varying the angle of incidence thereof, means for varying the camber of said vanes on either side of a neutral position, servo-motors for controlling the angle of incidence and camber respectively and means automatically controlled by lateral wind pressure and centrifugal action for controlling the action of said servo-motors, said servo-motor for varying the cambers of the vanes being also controlled by the speed of the vehicle.



Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,  
MAESCOURT,  
MAIDENHEAD,  
BERKS.

MEMORANDUM.

Captain B. Crossley Meates,  
C/o Mrs. Sears,

REFERENCE. Collingtree Grange,

J/MW.

COLLINGTREE,

Fri:11:Aug:22.

Nr. Northampton.

Dear Captain Crossley Meates,

I enclose copy of letter received from Messrs. Rolls-Royce Ltd., and hope to go to Waddon next week to see what can be done about a crankcase for the "Hawk" Engine.

"Punch" is quite fit and very fond of the Kids. I have made up a bed for him in the Cow-shed where he sleeps at night.

With kind regards to all,

Yours sincerely,

*Edmond E. Johnson*



Copy of letter from Rolls-Royce dated the 8th instant.



(C O P Y)

Rolls-Royce, Ltd.,  
Derby.

8th August 1922.

D/L14/B8.8.22.

Edmond E. Johnson Esq.,  
Maescourt,  
Maidenhead,  
BERKS.

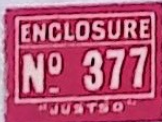
Dear Sir,

re Engine 1 Hawk 168.

With reference to the above mentioned engine which is at our Works, we beg to give you below estimate for the necessary work.

- |  |                         |
|--|-------------------------|
| (1) Stripping down engine to the stage in which it was seen by you on the 3rd instant.....   | 17. 7.                  |
| (2) Parts necessary to complete the engine to our general arrangement drawing with the exception of engine feet (also excluding replacing the top half of crankcase which is cracked.....) | £3. 14. 5.              |
| (3) Further stripping down of engine to enable new crankcase to be fitted, should it be possible for you to obtain one.....  | £1. 6. 5.               |
| (4) Re-erecting engine, including fitting of new crankcase (to be supplied by you) including fitting of the new parts referred to in item (2).....   | £6. 1. 0.               |
|  | <hr/> £11. 19. 5. <hr/> |

With regard to item No. (2), the parts to be supplied are as shown in the attached list, some of which have already been specially made when we were endeavouring to complete the work on the engine by the 3rd instant. The list does not, of course, include a new top half crankcase as we understand you are endeavouring to procure one elsewhere.





Concerning item No. (4) nothing is included for attempting to patch up or weld the existing crankchamber, as we strongly deprecate any such procedure, but our estimate is made on the understanding that we shall be supplied with a new crankcase or one that is equal to new and which can be fitted as though it were a new one without entailing any extra labour.

We trust you will be fortunate enough to obtain a suitable crankcase as we have no pattern and consequently to manufacture one would be out of the question.

Our estimate does not provide for any running or testing of the engine after re-erecting.

Terms:- Net cash before re-delivery of engine from our Works.

Prices do not include delivery.

We enclose an order form herewith which kindly sign and return to us, for which we beg to thank you in anticipation.

We are,

Yours faithfully,

For and on behalf of  
ROLLS-ROYCE. LTD.,

(sgd) John DeLooze.  
Secretary.



(C O P Y)

1 HAWK 168. Order No. 91988.

PARTS MISSING.

<u>Qty.</u>	<u>Piece No.</u>	<u>Description.</u>
1.	E9453.	Suction Pipe with Branch. E9366.
2.	E20448	Rubbers.
4.	E10107	Clips
4.	E 7532	Packings.
4.	E 6336.	Bolts.
4.	E 6333	Nuts.
1.	E 8521.	Pipe
1.	E7498	Washer.
2.	K210.	Bolts.
2.	K4407	Washers.
2.	K4508	do.
2.	K4310.	Nuts.
2.	K1722.	Cheesehead screw for water Pipe Bracket.
2.	K4003.	Nuts for Water Pipe Bracket.
2.	K5403.	Washers for Water Pipe Bracket.
2.	K4401.	Washer .. .. .
13 feet.		Priming Pipe with nuts and nipples
1.	E10747	Cap. )
1.	E10749	Nut )for low pressure oil pipe.
1.	K4404.	Washer)
1.	U1440.	Nut.
1.	F4331.	Nipple.
1.	E7545.	Nut for Oil Filter.
1.	E7546.	Nipples for Oil Filter.



1.	E7547	Nut for Pump.
1.	E7548	Nipple.
1.		C.H. Throttle Stop screw and nut.
1.		Throttle cover screw.
1.		Main Jet and Pilot Jet (200 c.c.)
1.	E11036	Control Rod. ) C.H.
1.	E11953.	Jaw. )
1.	E9194.	Jaw. )
2.	K4307	Nuts. )
2.	K6507.	Pins. )
2.	K4602.	Pins. )
1.		Lodge Terminal Nut. 2 screws missing from magneto.
1.	F 4331.	Nipple )
1.	U 1440	Nut. ) for Air Pump.
1.	E 7144.	Hub Lock Plate.
2	E 5969	Nuts.
6½	E20447	Rubbers.
1.	E20448.	Rubbers.
12 ea	E18632/3	Clips and Packings.
2.	E10107. b	Clips.
2.	E 7532.	Packings.
15.	E 6336.	Bolts.
14.	E 6333	Nuts.
	E 7622	Washers.

---



Phone: MAIDENHEAD, 297.

EDMOND E. JOHNSON,  
MAESCOURT,  
MAIDENHEAD,  
BERKS.

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,  
ASCOT,

REFERENCE.

J/MW.

B E R K S .

Sat:2:Sept:22..

Dear Captain Crossley Meates,

I have had some very interesting discussions with a Mr. Williams of Windsor. He was a pilot during the War and afterwards a designer at Farnborough; in addition to this he has Railway experience, and is at present employed as a Designer for Peters of Slough.

I enclose you copies of 2 letters which have passed between us.

Mr. Williams has modified his views about the substitution of Elevators for the second Bogie, but he still maintains that the controls of the Aerofoils should act directly from the Vehicle itself, both for Centrifugal Force and Side Wind, and by so doing the Pennant would be dispensed with. He further suggests that the Servo-motors should control the Aerofoils by oil pressure, thus dispensing with gears.

I may say that so far as the Demonstration Vehicle is concerned, I propose dispensing with both the Bogies and substituting an under-frame with a fixed Wheel base of 6' 9", by so doing I reduce the number of Wheels carrying the Vehicle to one half; this will make a considerable reduction in the weight.

When you return from your holidays I should like to try and arrange for you to have a discussion with Mr. Williams.

Hoping you will have all had a pleasant holiday.

"Punch" is quite fit; he has, however, run the legs off the "Bella Vista" dog..

Yours sincerely,

*Edmond E. Johnson*

Copy of letter to Mr. Williams dated the 17th. ultimo.  
Copy of letter from Mr. Williams dated the 26th ultimo.

ENCLOSURE  
No 416  
"JUSTO"



(C O P Y)

48, Queens Road,

WINDSOR,

26-8-22.

Dear Mr. Johnson,

Yours faithfully,

I was very pleased to receive your letter, following my visit to you, touching upon my suggestions of doing away with the necessity of a second bogie in connection with your Mono-Rail, and I regret not having written you before this; but I wanted to read carefully through your specification before doing so. I have since thought over this suggestion I made to you and have also come to the conclusion that the advantage gained, if any, would not compensate for the many obstacles that would arise in trying to maintain, horizontally, the vehicle upon one bogie.

In your letter you put forward several reasons against this theory but I fail to agree with some of them which I will mention later. But in my opinion, the chief reason against the single bogie is the steering of the vehicle. At speed, the vehicle would not follow its rail track without this guidance from its rail. Assuming this one bogie scheme is a proposition, you put forward your reason of insufficient Propeller clearances and the enormous additional friction upon the Pilot wheels as against a second bogie. My contention is, that if these fore and aft elevators were sensitive and would maintain the vehicle horizontally, there would be no pressure upon the Pilot wheels because as soon as the vehicle had a tendency to divert from this horizontal path, the elevators would immediately right it. Again you say that the resistance offered by the elevators would exceed the friction of a second bogie. I might put forward the same argument against your mono-rail, that the resistances offered by the Aerofoils is greater than the friction incurred by running a similar vehicle, weight and bogies on a twin track.

I have read your specification and found the reading very interesting but I cannot determine how you make allowances for the centrifugal forces acting upon pendulum and the correct use of the pennant. Do I gather that the pennant compensates for side winds, etc.? Would not these side winds be corrected by the pendulum, for if a certain centrifugal force caused the vehicle to lean from the vertical and an additional side wind force in the same direction would only cause the vehicle to diverge still more, or assuming the side wind equalled the centrifugal force the vertical would be maintained.

I shall

ENCLOSURE  
No 416



I shall be very pleased to make an appointment with you. I can arrange wither Wed. or Friday evening this week - either here at my rooms or at your address, which ever is more convenient for you.

Yours faithfully,

(sgd) G. Williams.

Dear Mr. Williams,

In reference to your call here last night and your suggestion to mount the Mono-Rail Vehicle on a single logi- by installing elevators, I have seen in the construction that this would be impractical for 2 reasons.

In the first place there is only a small clearance allowed between the Mono-Rail and the side of the support consequently if the road were tilted very slightly, the Propeller would be smashed to pieces.

In the second place any force applied to the wheels would create enormous friction on the floor which would mean installing a heavy roller on the centre Road, the addition of such a roller would be adding the second Road, and this would considerably increase the resistance offered by the Elevators would be considerably greater than the additional resistance of the Rolling friction offered by the second Road.

Assuming it took 100 H.P. to develop 100 H.P. on a 1 ton Vehicle, of this under 10 H.P. would be utilized in Rolling Friction when employing 2 roads, the remaining 90 H.P. being absorbed by Air Resistance and the inevitable transmission losses, so that at high speeds the power required is almost negligible, it is only at low speeds, when the propeller effort is starting, that rolling friction and Mono-Rail or Roller resistance play a considerable part.

For instance it takes 1 ton to roll 1 ton on a 1 ton road filled with ordinary sand, and a Roller resistance one ton can roll the same 1 ton.

I have to thank you for your interest in the project and to have the pleasure of seeing you very soon.  
Yours faithfully,  
(sgd) G. Williams.



(C O P Y)

G. Williams, Esq.,  
48, Queens Road,  
WINDSOR.

J/MW.

Thur:17:Aug:22.

Dear Mr. Williams.

In reference to your call here last night and your suggestion to mount the Mono-Rail Vehicle on a single Bogie by installing Elevators, I have come to the conclusion that this would be impracticable for 2 reasons.

In the first place there is only a small clearance allowed between the Mono-Rail and the tips of the Propeller, consequently if the nose were tilted very slightly, the Propeller would be smashed to atoms.

In the second place any fore and aft tilting would create enormous friction on the Pilot Wheels. To guard against this would mean installing Track Wheels fore and aft of the centre Bogie, the addition of such gear would be tantamount to adding the second Bogie, apart from these considerations I feel confident that the Resistance offered by the Elevators would be considerably greater than the additional Resistance of the Rolling Friction offered by the second Bogie.

Assuming it took 100 H.P. to develop 100 M.P.H. on a 1 ton Vehicle, of this under  $1\frac{1}{2}$  H.P. would be absorbed in Rolling Friction when employing 2 Bogies, the remaining 98.5 H.P. being absorbed by Air Resistance and Air Propeller transmission losses, so that at high speeds Rolling Friction is almost negligible; it is only at low speeds, particularly the tractive effort in starting, that Rolling Friction counts, and Ball or Roller Bearings reduce this item very considerably.

For instance it takes 7 men to push on level track a 27 ton Coach fitted with ordinary Bearings, whereas with Roller Bearings one man can push the same Coach.

I have to thank you for your suggestion, and hoping to have the pleasure of seeing you again before long.

Yours faithfully,  
(sgd) Edmond E. Johnson.



Houdaille Hydraulic Suspensions have been recently fitted to the following cars:—

H.M. Queen Alexandra's Daimler  
H.R.H. The Prince of Wales's Rolls Royce  
H.R.H. The Duke of York's Armstrong Siddeley  
H.R.H. Prince Henry's Armstrong Siddeley  
H.R.H. The Duke of Connaught's Daimler  
H.R.H. Princess Beatrice's Lancia

TELEPHONE:  
MAYFAIR 6267.  
TELEGRAMS:  
HOUDAILLE·PHONE·LONDON.

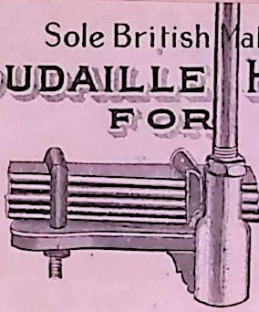


**HOUDAILLE HYDRAULIC SUSPENSION CO., LTD.**

Sole British Makers and Concessionaires of the Patent  
**HOUDAILLE HYDRAULIC SUSPENSIONS**  
FOR MOTOR CARS.

*The only known method of  
Automatically adapting Motor  
Car Springs to the varying  
conditions of road surfaces.  
Add 25% to the life of Tyres  
by always keeping the Wheels on  
the*

**DCD/DS**



Offices and Show Rooms  
41, New Bond Street, LONDON, W.1.  
3rd October, 1922.

19

Edmond E. Johnson, Esq.,  
"Maescourt",  
Maidenhead,  
Berks.



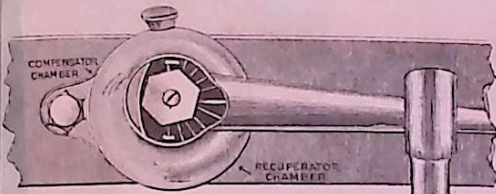
Dear Sir,

Ref J/INW.

Replying to your enquiry of yesterday's date we enclose you full descriptive Catalogue of the Houdaille Hydraulic Suspensions, from which you will observe that assuming the vehicle running on a Mono-rail has springs which are not too stiff, the Houdailles would be perfectly efficient, as described, on a vehicle running on such rail at 120 miles an hour, or even more, just the same as the big 200 H.P. Benz car travelling at nearly 130 m.p.h. over the Track at Brooklands was described by its Driver, Mr. Hornsted, several years ago in a letter to us as being as comfortable as a tram on rails, although incapable of holding the Track without Houdailles, even 80 miles an hour. We believe you will thoroughly grasp the system

ENCLOSURE  
No 455  
"JUSTCO"





TELEPHONE:  
MAYFAIR 6267.  
TELEGRAMS:  
HOUDAILLE · PHONE · LONDON.



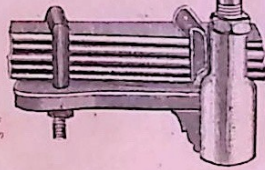
# THE HOUDAILLE HYDRAULIC SUSPENSION CO., LTD.

Sole British Makers and Concessionaires of the Patent  
**HOUDAILLE HYDRAULIC SUSPENSIONS**  
**FOR MOTOR CARS.**

*The only known method of  
Automatically adapting Motor  
Car Springs to the varying  
conditions of road surfaces.*

*Add 25% to the life of Tyres  
by always keeping the Wheels on  
the road.*

**DCD/DS**



Offices and Show Rooms  
41, New Bond Street, LONDON, W.1.  
3rd October, 1922.

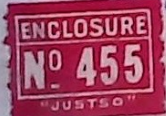


Edmond E. Johnson, Esq.,  
"Maescourt",  
Maidenhead,  
Berks.

Dear Sir,

Ref J/MW.

Replying to your enquiry of yesterday's date we enclose you full descriptive Catalogue of the Houdaille Hydraulic Suspensions, from which you will observe that assuming the vehicle running on a Mono-rail has springs which are not too stiff, the Houdailles would be perfectly efficient, as described, on a vehicle running on such rail at 120 miles an hour, or even more, just the same as the big 200 H.P. Benz car travelling at nearly 130 m.p.h. over the Track at Brooklands was described by its Driver, Mr. Hornsted, several years ago in a letter to us as being as comfortable as a tram on rails, although incapable of holding the Track without Houdailles, even 80 miles an hour. We believe you will thoroughly grasp the system





(C O P Y)

J/MW Messrs The Houdaille  
Hydraulic Suspension Co., Ltd.,

Dear Sirs,

MOTOR ADV.

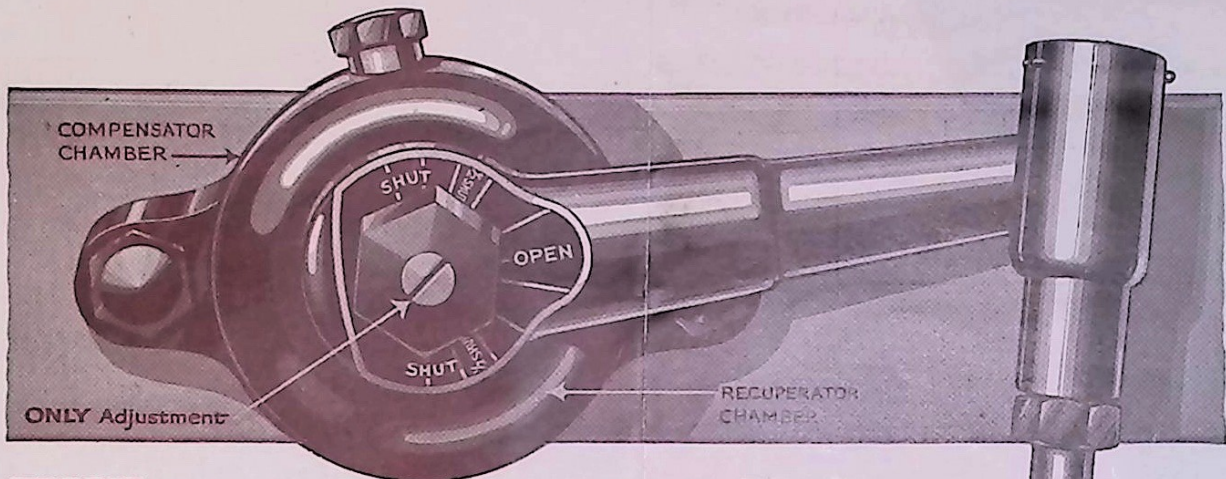
I have seen your advertisement in the above, claiming "Wheel Bouncing Eliminated" If your appliance were incorporated upon a Vehicle running upon a Mono-Rail, would bounding be still eliminated at 100 to 120 M.P.H. The weight of the Vehicle would be approximately 1 ton to 25 cwts, and there would be 2 Track Wheels provided with steel treads and double flanges. The power, namely, 100 H.P. is large in proportion to the weight, hence the fear of bounding.

Yours faithfully,

(sgd) Edmond E. Johnson.



THE TYRES CLING TO THE ROAD



THE (PATENT) Shock and Recoil Absorbers  
**Houdaille**  
HYDRAULIC Suspensions  
for FRONT & BACK Axles

THE ONLY KNOWN METHOD OF AUTOMATICALLY ADAPTING MOTOR CAR  
SPRINGS TO THE VARYING CONDITIONS OF ROAD SURFACES.

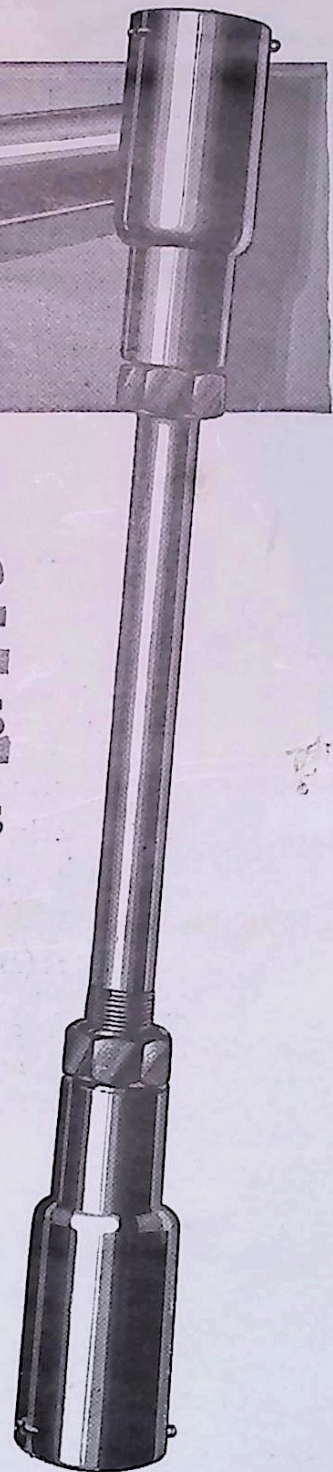
**Descriptive Catalogue**

With Complete Fitting Instructions.

THE HOUDAILLE HYDRAULIC  
SUSPENSION COMPANY LTD.  
41 NEW BOND STREET, LONDON, W.1.

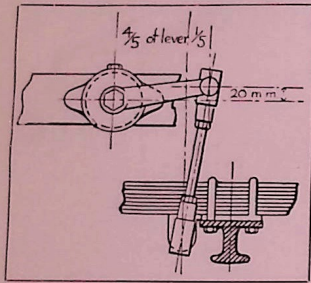
'Phone—  
MAYFAIR 6267

Wires—  
"HOUDAILLE, PHONE, LONDON"



WHEEL BOUNCING ELIMINATED





Chassis Type.

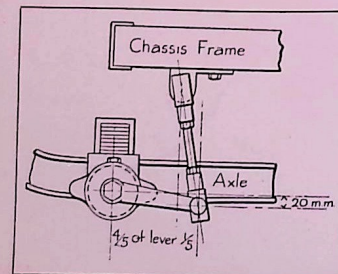
THE TYRES CLING TO THE ROAD

**J**UST as the Hydraulic Buffer is the only means of smoothly checking the recoil of modern guns, so are the **HOUDAILLE PATENT HYDRAULIC SUSPENSIONS** the only means of **progressively checking the recoil of car springs**—be they cantilever or any other type—thus preventing their rebound, which causes road shocks, skidding, and danger when driving even moderately fast.

There is only **one** Model, but it is assembled in **three** ways for convenience in fitting to any car—small or large, as follows :

- (1) for bolting to **Chassis** (back or front) and coupling up with axle.
- (2) for bolting to a bracket attached to **Axle** (back or front) **with vertical bolt lugs** and coupling up with chassis.
- (3) as (2) but with **horizontal bolt lugs**.

**Note :** Axle type must not be bolted to chassis, nor chassis type to axle or the action will be reversed and the Houdailles will be checking compression instead of recoil.



Axle Type.

WHEEL BOUNCING ELIMINATED

## Concerning SHOCK ABSORBERS

Essential facts which must be embodied in a perfect Shock Absorber.

**I**N these days, Shock Absorbers are devices as well-known and appreciated as the Magneto or Electric Starting and Lighting Sets.

*What constitutes a good Shock Absorber ?*

For a Shock Absorber to fulfil the conditions for which it is intended :—

- (1) **It must only check the action of the Car Springs during their recoil**, without checking their previous compression, so as to leave them as flexible as possible in order to absorb the initial road shock that is given to the Springs. (Checking compression stiffens the Springs.)
- (2) **It must act progressively**, viz., in relation to the continually changing force of the rebound of the Car Springs, which can be done by no other means than Hydraulics, viz., the quicker or slower passage of Oil through valves (neither spring nor friction type Shock Absorbers can possibly do this).
- (3) **It must be capable of valve adjustment by hand**, so as to set it easily to accurately check the force of the recoil of the springs of any car to which it is fitted, without such adjustment being capable of variation excepting at will.
- (4) **Its efficiency must not be capable of variation**, otherwise constant adjustment will be necessary to take up wear (as in the case of spring or friction types).
- (5) **Since the foregoing advantages are only obtainable by Hydraulics**, means must be provided for preventing air (which is compressible, whereas oil is not) from entering the working chamber, which can only be done by a reserve supply of Oil (automatic recuperation) being embodied in its design. (This is a Houdaille master patent.)

**THE HOUDAILLE PATENT HYDRAULIC SUSPENSIONS (SHOCK AND RECOIL ABSORBERS FOR THE FRONT AND BACK OF ALL CARS) ARE THE ONLY SHOCK ABSORBERS WHICH EMBODY ALL OF THESE ABSOLUTELY NECESSARY ESSENTIALS AND THEY HAVE HELD THE FIELD FOR ELEVEN YEARS.**

WHEEL BOUNCING ELIMINATED



Only One Moving Part.

The sectional drawings inside next sheet show how the Houdaille Suspensions are made and how they work. It will be observed that there is only one moving part, viz., the rotating Impellor, which is constantly in Oil, thus wear is negligible. The fitting instructions (see further on) must be carefully adhered to, as fitting at incorrect angles may lead to the Rotating Impellor impinging on the stationary Reacting Member and damaging it. All parts are made of special steel. **The Liquid—or Hydraulic Medium—employed, is Castor Oil, the density of which does not vary with changes of temperature. Thus, their efficiency never varies. Use nothing else for refilling the recuperator.**

Recuperation.

**The Recuperator Chamber** should be refilled with Castor Oil after running every 3,000 to 4,000 miles. No other attention is required beyond a little grease occasionally in the ball joints.

Adjustment.

The efficiency of the Houdaille Hydraulic Suspensions never varies, because the Castor Oil with which they are filled remains of the same density in hot or cold weather. Anyone can adjust the Regulating Valve on a short road test so as to correctly check the recoil of the Springs of any car—small or large—to which they are fitted.

Appreciation.

Vast numbers of Cars have, during the last eleven years, been fitted with the **Houdaille Hydraulic Suspensions** throughout the world, and they are part of the Works equipment of a large number of the highest class cars.

**Houdaille Hydraulic Suspensions are manufactured in England, France, and U.S.A.**

The Company reserve the right to make such alterations in the specification as they may from time to time deem desirable.

WHEEL BOUNCING ELIMINATED

## Houdailles are not only a Necessity— they are an Investment.

### EPITOMISED ADVANTAGES FROM FITTING A SET OF HOUDAILLES TO ANY CAR, SMALL OR LARGE.

**THEIR EFFICIENCY NEVER VARIES**, AND THE HYDRAULIC MEDIUM EMPLOYED BEING **CASTOR OIL**, REMAINS OF THE SAME DENSITY IN SPITE OF VARIATIONS OF TEMPERATURE.

**THEY ABSORB ROAD SHOCKS** AND PREVENT BODY-SWAY AND SKIDDING.

**INCREASED COMFORT IN DRIVING**, DUE TO DAMPING OUT THE UNDUE REBOUND OF THE CAR SPRINGS.

**FULL FLEXIBILITY OF THE CAR SPRINGS** RETAINED, ONLY THEIR EXCESSIVE RECOIL, WHICH IS THE CAUSE OF SHOCKS, ETC., BEING DAMPED DOWN.

**WEAR OF TYRES LARGELY REDUCED** AS THEY ARE CAUSED TO CLING TO THE ROAD AND ROLL OVER INEQUALITIES INSTEAD OF BOUNCING AND DITHERING.

**DAMAGE** CAUSED BY ROAD SHOCKS TO ENGINE, CHASSIS AND BODYWORK IS **ELIMINATED**.

**ABSENCE OF ANY FATIGUE TO THE DRIVER** AFTER A LONG RUN, SINCE NO VIBRATION IS TRANSMITTED THROUGH THE STEERING COLUMN, AND FRONT WHEELS ARE PREVENTED FROM DEFLECTING ON ROUGH ROADS.

**SPEED NEED NOT BE REDUCED** ON ROUGH ROADS OVER WHICH ONE CAN DRIVE FAST, WHILST HOLDING THE STEERING WHEEL AS LIGHTLY AS ON SMOOTH ROADS.

**NO ATTENTION REQUIRED** BEYOND REFILLING THE RECUPERATOR AFTER EACH 4,000 MILES RUNNING, WITH **CASTOR OIL**, AND OCCASIONALLY PUTTING SOME GREASE INTO THE BALL JOINTS.

**VALVES ADJUSTABLE BY ANYONE** TO CORRECTLY CHECK THE RECOIL OF THE SPRINGS OF ANY CAR—LARGE OR SMALL—TO WHICH THE HOUDAILLES ARE FITTED.

**GENERALLY** :—LARGELY INCREASED ECONOMY IN UPKEEP DUE TO THE WHEELS **ROLLING**, INSTEAD OF **BUMPING** OVER UNEVEN ROAD SURFACES.

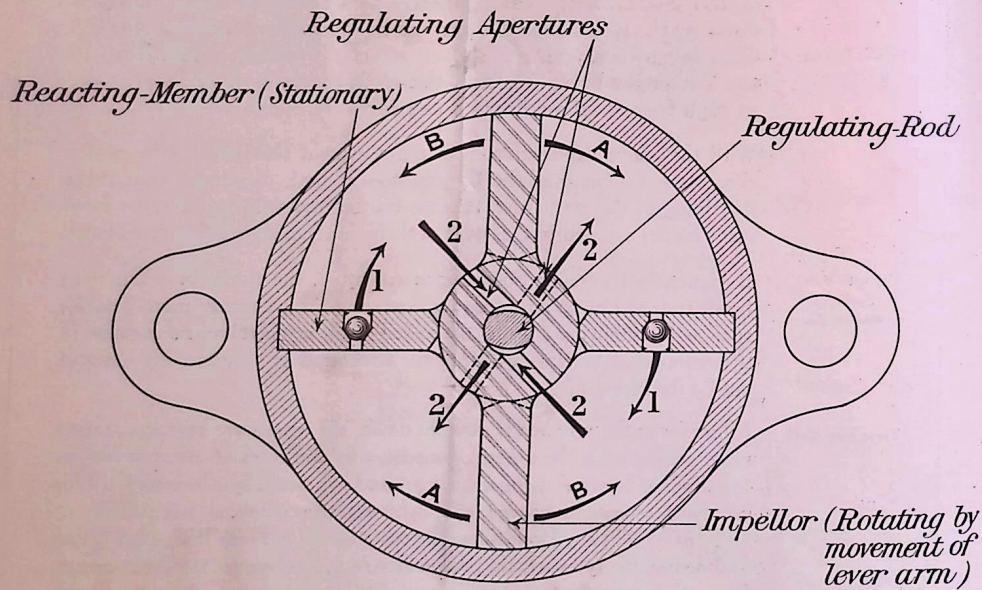
WHEEL BOUNCING ELIMINATED



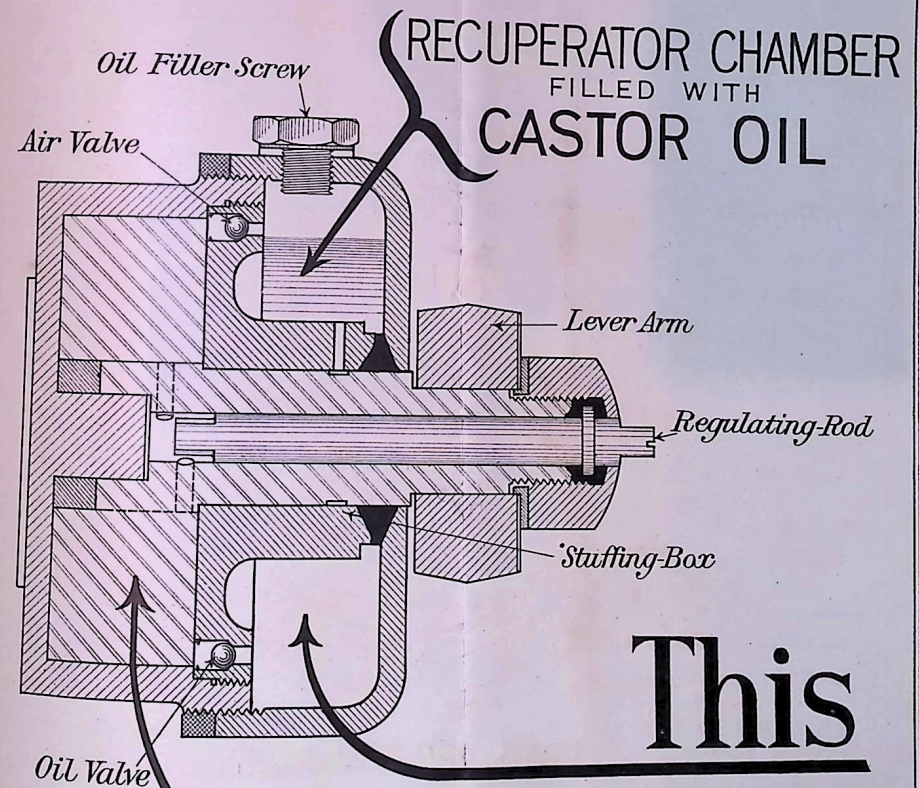
# THE HOUDAILLE PATENT HYDRAULIC SUSPENSIONS.

PATENTED THROUGHOUT THE WORLD

SELF-COMPENSATING SHOCK AND RECOIL ABSORBERS FOR ALL MOTOR CARS.



- 1\_ WHEN THE CAR SPRINGS ARE COMPRESSED. *Impellor moves in direction A. The valves 1.1. open to avoid any checking action.*
- 2\_ RECOIL OF SPRINGS. *The car rebounds. Impellor moves in direction B. The valves 1.1. close, the oil can pass only through regulating apertures 2.2.*



**This feeds That**



*How the Houdaille Hydraulic Suspension deals with the Rebound of the Car Springs.*

Car Springs absorb Energy When at rest or travelling along a perfectly smooth road, the Car Springs are compressed to an extent depending on the load carried. So soon, however, as humps, potholes or other road inequalities are met, the springs receive extra compression due to passing over them and in so doing absorb energy. The Houdaille Hydraulic Suspensions offer no resistance when the Car Springs are being compressed so that their full flexibility is available for absorbing the initial road shocks, **but so soon as the Springs rebound, or start to get uncompressed**—which is caused by the energy absorbed being given off—and this occurs many times per second), **the Houdailles at once check their movement, and the Springs reach their former or normal position, but at a rate which is diminished progressively and to the extent desired through the hydraulic braking effect of the Houdailles; consequently, this rebound being damped down by the Houdailles, the springs no longer constantly throw the Chassis upwards, and the after effects involving discomfort to the Passenger being avoided, the riding over bad surfaces, even at high speeds, is made quite comfortable.**

Perfect Comfort is obtained. With the above explanation, it is quite evident that any Device which checks the flexibility of the Car Springs in both directions must make the riding of the car harder, because the Springs will have thereby been made harder and deprived of most of their ability to absorb the initial blow.

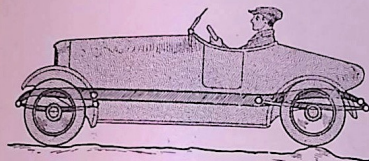
Car with Harsh Springs: What to do. If Houdaille Hydraulic Suspensions are fitted, the riding of a Car with harsh springs can be improved by rendering these Springs more flexible, such as by removing a leaf; the added flexibility involves no increase in the rebound of the springs, since such rebound is progressively damped out by the Houdailles.

Tyres keep Cool and Last Longer. Safer Driving. Their Economy. Moreover as the rebound is damped down, the wheels are kept in constant close contact with the ground, consequently the tyres do not run hot, as the slipping between them and the ground is practically eliminated. This has been repeatedly proved, and, whereas after running some thirty or more miles without Houdailles, the tyres would get very hot; after fitting Houdailles, the tyres remain comparatively cool whatever the distance run. Since, therefore, the tyres are compelled to remain in contact with the road, it naturally follows that they last much longer, better speed and lower petrol consumption are obtained, the steering is enormously improved, and rough roads can be taken at speed without discomfort to the Passengers, with perfectly easy and safe steering, and without any fatigue to the Driver, in fact the cost of a complete Set and fitting is soon amply repaid by the resultant lack of wear and tear to the whole car.

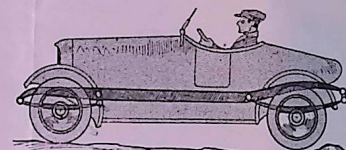
WHEEL BOUNCING ELIMINATED

The following electros, description and appreciation are extracted from "The Motor."

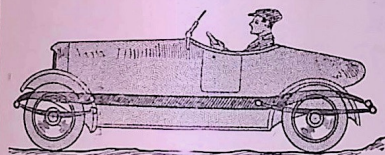
Diagrams showing what happens to the back wheels of any car (the effect on the back wheels only is taken for the sake of clearness) when travelling, thus demonstrating the need of fitting a set of Houdailles to all motor cars, whatever type of springing be employed. The set consists of **two pairs**—one pair for the front and one pair for the back of the car.



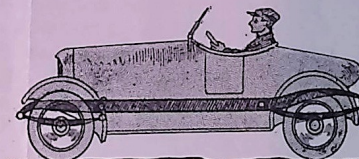
When a Car hits a bump the Axle rises, compressing the Spring and raising the Chassis suddenly.



The momentum given to the unsprung mass—that is, the Axle and Wheels—causes it to jump; at the same time the Chassis continues to rise.

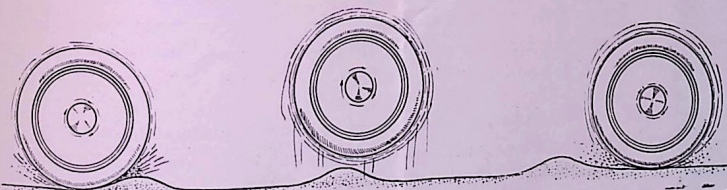


The Wheel returns to the road surface and the weight of the Car, coming on to an unstressed Spring, sways down, again over compressing the Spring; then come the uncomfortable upward sways, with shocks and damage to tyres and mechanism.



The Houdailles prevent this unwise motion, hold the Car to the road, enabling any speed on rough roads with absence of shocks, and great ease in steering.

Further evidence showing what happens to the Tyres of a Car to which Houdailles are not fitted.



The tyre strikes a bump which it mounts and then, continuing in the same plane, leaves the road. In the air, relieved of road adhesion, the Wheel rapidly accelerates—partly owing to differential action—then, whilst spinning at high speed it strikes the road again, with the result that it slips and bounces, and thus causes unduly rapid tyre wear, road shocks, skids and danger.

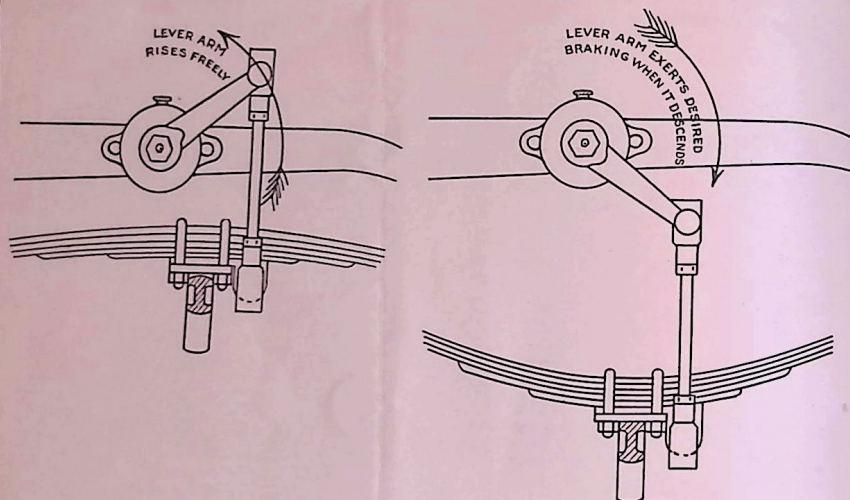
"We have had considerable personal experience with Houdaille Hydraulic Rebound Dampers and can vouch for their efficient working in practice. They make the car hold the road on corners as well as on the straight. . . . When travelling slowly, the car springs are not deflected very much and so their suppleness enables them to check shock. When travelling fast and their deflection is large, the Houdailles come into action, and check that objectionable sway and bouncing which prevents the car from holding the road."

WHEEL BOUNCING ELIMINATED



## Houdailles Bolted to the Chassis

(Chassis Type).



COMPRESSION OF SPRINGS:  
THE CHASSIS DESCENDS.

RECOIL OF SPRINGS:  
THE CHASSIS REBOUNDS.

The Car being at rest, its springs are in their normal position and **the lever arm of the Houdaille must be slightly above the horizontal position with the passengers on the car.** This position would remain the same if the car were travelling on an absolutely smooth road.

In actual practice so soon as a blow is received from the constant road inequalities encountered, the car springs are compressed, the chassis descends, the lever arm moves freely upwards, and the springs themselves have absorbed the initial shock.

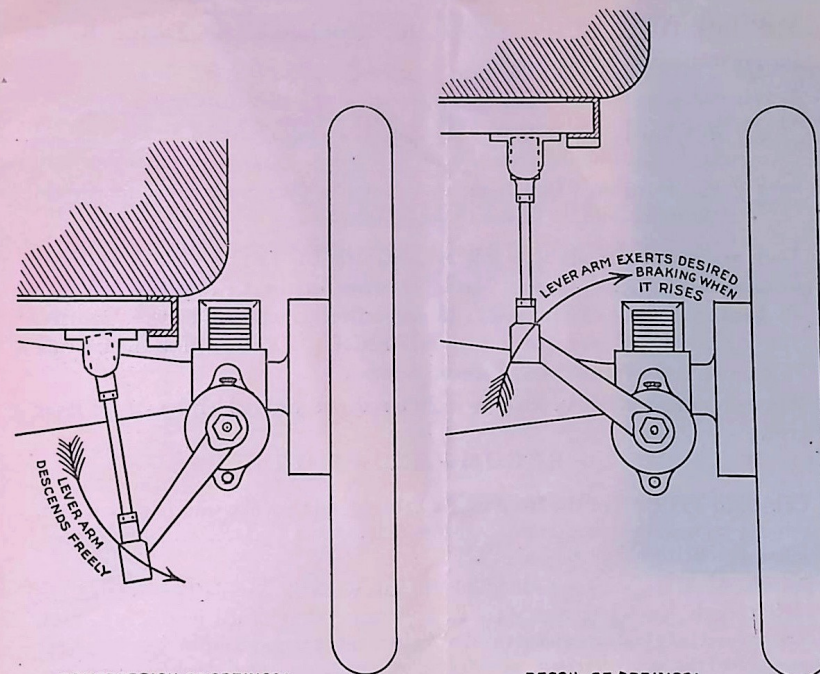
The descent of the chassis having been stopped by the compression of the car springs, these immediately recoil, moving the chassis upwards and the lever arm of the Houdaille goes down, but at reduced speed, due to the hydraulic braking action of the Houdaille in checking the speed of the recoil in the manner required, until equilibrium is established between the weight of the chassis and the tension of the springs. The Houdaille will thus have damped out the recoil and prevented shocks.

**Consequently, when Houdailles are bolted on the chassis THEY WILL CHECK THE RECOIL AS THE LEVER ARM DESCENDS.**

WHEEL BOUNCING ELIMINATED

## Houdailles Bolted to the Axle

(Axle Type).



COMPRESSION OF SPRINGS:  
THE CHASSIS DESCENDS.

RECOIL OF SPRINGS:  
THE CHASSIS REBOUNDS.

What takes place is precisely the same as is described on the preceding page excepting that when at rest, **the lever arm must be slightly below the horizontal position with the passengers on the car,** and when the springs are compressed the lever arm of the Houdaille moves downwards, and when they recoil and the chassis again moves upwards, the lever arm of the Houdaille comes up again (instead of down as is the case when they are fitted to Chassis).

**Consequently, when the Houdailles are bolted on to the axle THEY WILL CHECK THE RECOIL AS THE LEVER ARM ASCENDS.**

It is obvious since shocks are received and transmitted through both the front and back Axles, that to obtain perfect suspension, it is necessary to fit a complete set, viz., a pair on the front and a pair on the back of a Car.

WHEEL BOUNCING ELIMINATED



## Information Required with Orders.

THE HOUDAILLE SUSPENSIONS ARE ASSEMBLED IN THREE WAYS for convenience of fitting, viz. :

- (1) For bolting to the Chassis and coupling up with the axle (**Chassis Type**).
- (2) With **Vertical Bolt Lugs**, for bolting to a plate connected to the axle and coupling up with the Chassis (**Axle V Type**).
- (3) With **Horizontal Bolt Lugs**, for bolting to a plate connected to the axle and coupling up with the Chassis (**Axle H Type**).

They are likewise made with **TWO LENGTHS OF LEVER ARMS** both for Chassis and for Axle Types. The lever arms for the **CHASSIS TYPE** are all cranked, and are of 6 in. and  $7\frac{1}{4}$  in. respectively, measured between centres. The **AXLE TYPE** are made with **STRAIGHT LEVER ARMS** measuring  $7\frac{1}{4}$  in. and  $8\frac{1}{2}$  in. respectively, between centres.

When ordering, specify which type is required, and with which length of lever arm.

### RECOMMENDATIONS.

**CHASSIS TYPE.** For the front of any Car use the Houdailles with lever arm 6 in. between centres, the model with lever arm  $7\frac{1}{4}$  in. between centres can also be used, unless the arm would be too long.

For the back of any car exceeding about 10 h.p., when the Chassis Type is fitted, the model with the longer lever arm, viz.,  $7\frac{1}{4}$  in. between centres should invariably be used, as the compression and subsequent recoil of the back springs is greater than that of the front springs, and the longer lever arm obviously allows for greater travel than the shorter one.

**AXLE TYPE.** The Houdailles with either of the two lengths of lever arm can be used on the front, the one with the  $7\frac{1}{4}$  in. between centres being more advisable for small cars.

For the back of larger cars than of about 15 h.p. and on sporting type cars, when Axle Type is fitted, the model with the longer or  $8\frac{1}{2}$  in. lever arm is preferable for the reason above mentioned.

If in doubt as to the types to fit, state MAKE, DATE and H.P. of Cars to which the Houdailles are to be fitted, and whether for front or back, as our records will indicate which types to send.

Price : £10 10 0 per pair.

£21 0 0 per Set of Two Pairs for Front and Back of a Car.

WHEEL BOUNCING ELIMINATED

## ESSENTIAL FITTING INSTRUCTIONS FOR HOUDAILLE PATENT HYDRAULIC SUSPENSIONS

In addition to the information given in the preceding pages, the Houdailles being instruments of precision, these instructions must be carefully adhered to, to ensure satisfactory results.

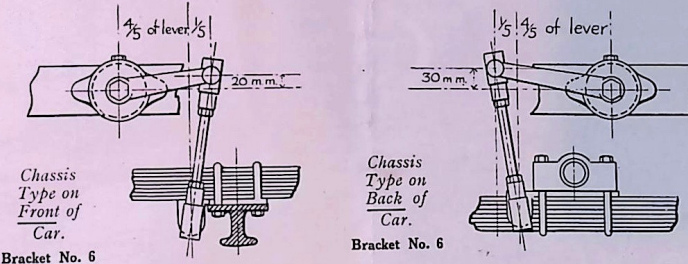
### FITTING TO CHASSIS—Back or Front—with cranked Lever Arms

Marked "Fit only to Chassis" on Lever Arms. Length of Lever Arms : (1) 6 in. between centres—for the Front and the Back of any Car. (2)  $7\frac{1}{4}$  in. between centres—for the Back (also Front if desired) of any Car. Specify Chassis Type when ordering, and also with which length of Lever Arm (see page 8).

Note.—Those assembled and marked for Chassis fitting must never be bolted to the Axle or, as is obvious from the preceding drawings and description, their action would be reversed, and they would be checking the compression instead of the recoil of the Car Springs.

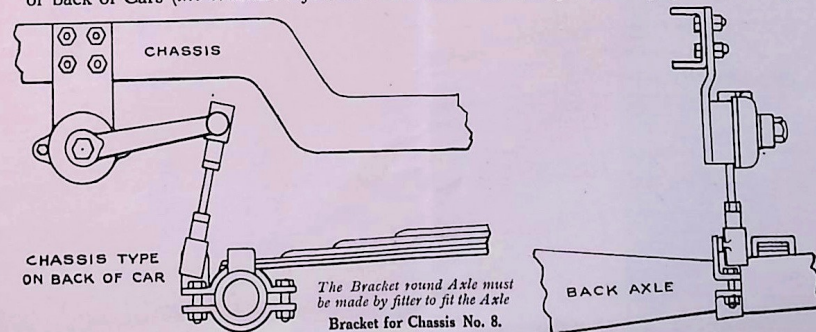
Take care when fitting that there is clearance for the upward movement of Lever Arm.

The following diagrams show the angles at which the Lever Arm and Connecting Links must be set with passengers on the Car, i.e., lever arms practically horizontal without passengers :—



NOTE.—The angle at which the lever arm is to be set on the back of a Car is 10 m/m greater than on the front—this is to allow for the recoil of the back springs, which will probably be greater than that of the front springs.

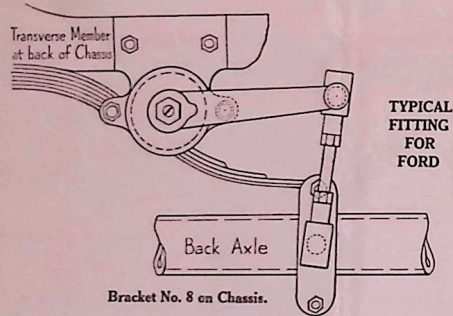
FURTHER EXAMPLES of some of the many ways of fitting to the Chassis on front or back of Cars (the brackets referred to are illustrated and priced on pages 17 & 18).



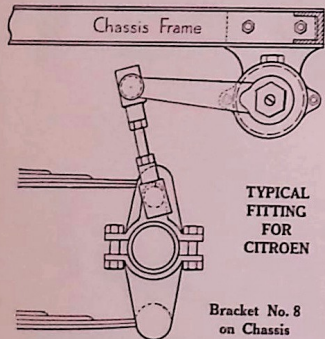
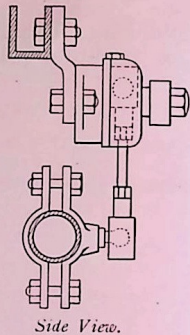
WHEEL BOUNCING ELIMINATED



FURTHER EXAMPLES OF FITTING TO CHASSIS  
(Continued).



Front View. Chassis Type on Back of Car.



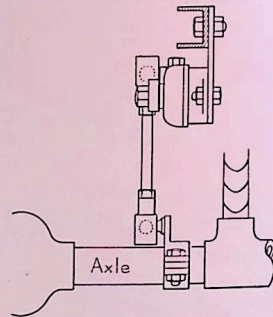
Front View. Chassis Type on Back of Car.

NOTE:

Complete sets of Brackets can be supplied for fitting Houdailles to back and front of Ford and Citroen Cars.

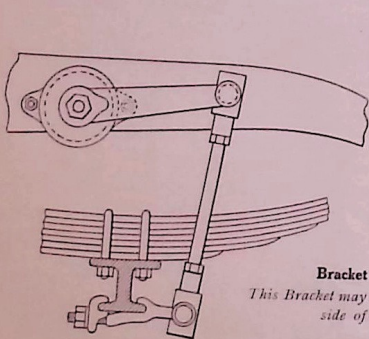
Price 72/- for complete set for the two pairs of Houdailles.

36/- for the one pair.

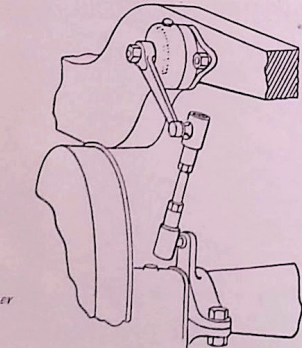


Side View.

Bracket round these Axles to be made to fit by Fitters (excepting for Ford and Citroen Cars, which are stocked).



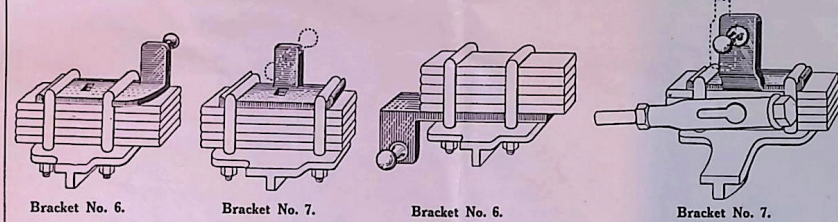
Chassis Type on Front of Car.



Chassis Type on Back of naked Chassis.

WHEEL BOUNCING ELIMINATED

FURTHER EXAMPLES OF FITTING TO CHASSIS (Continued).



Some usual methods of fitting Brackets on Axles where Chassis Type Suspensions are fitted.

For illustrations and prices of Brackets, see pages 17 and 18.

FITTING TO AXLE—BACK OR FRONT.

Marked "Fit only to Axle" on straight lever arms. Length of Lever Arms: (1) 7 1/4 in. between centres; (2) 8 1/2 in. between centres. When ordering specify Axle Type and state if with Horizontal or Vertical Bolt Lugs and with which length of Lever Arm. Either length may be used. We recommend the Houdailles with 7 1/4 in. centres for the front of any car, and also the back of light cars, and with the 8 1/2 in. centres for the back of large cars, although those with either length of Lever Arm can be used on the back or front. (see page 8).

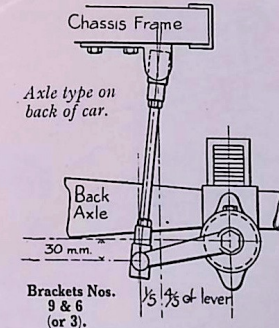
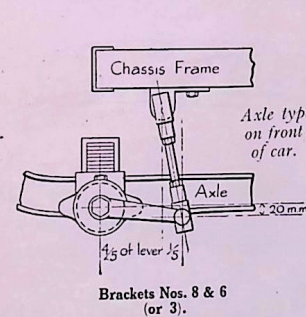
Note.—Those assembled and marked for fitting to Axle, must never be bolted to the Chassis or—as is obvious from the preceding drawings and description—their action would be reversed and they would be checking the compression instead of the recoil of the car springs.

Take care to fit so that there is clearance for the downward movement of the Lever Arm.

The following diagrams show the angles at which the Lever Arms and connecting links must be set with passengers on the car, i.e., lever arms practically horizontal without passengers.

Houdailles with Horizontal Bolt Lugs (Axle H)

Houdailles with Vertical Bolt Lugs (Axle V)

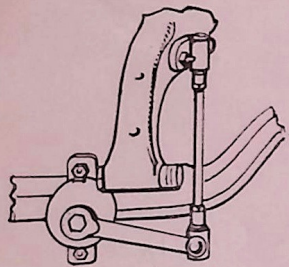


It will be noted that the angle at which the Lever Arm is to be set on the Back of a Car is 10 m/m greater than on the front; this is to allow for the recoil of the back springs, which will probably be greater than that of the front springs.

WHEEL BOUNCING ELIMINATED

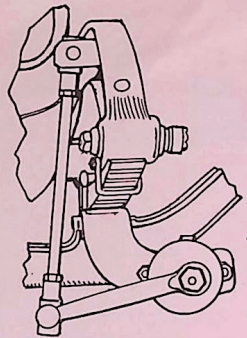


FURTHER EXAMPLES OF FITTING TO AXLE (Continued).

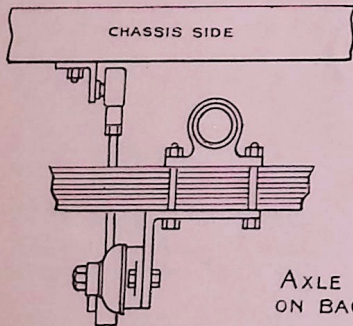


Brackets Nos. 3 and 1.  
Axle V fitting on front.

This Bracket to go at the back and be forged by fitter to precisely fit over the Axle.

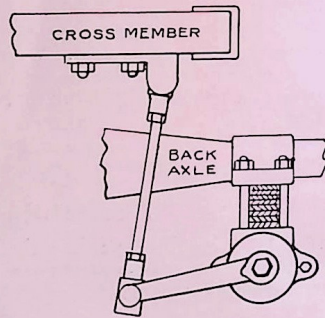


Brackets Nos. 3 & 4 (or 5, depending on width of Springs).  
Axle H fitting on front.  
The above method of fitting is also employed at back of Car.

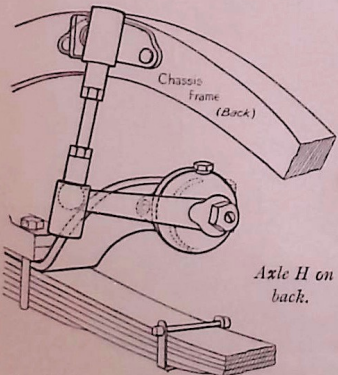


AXLE H TYPE  
ON BACK OF CAR

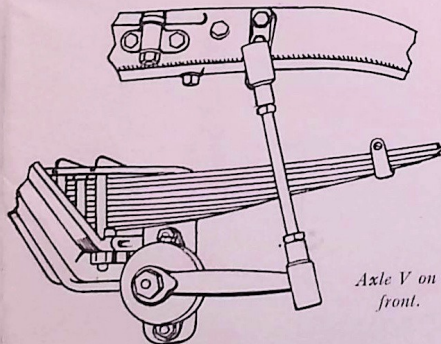
Brackets  
Nos. 6 (or 3)  
and 8.



Brackets Nos. 3 and 9 (turned upwards).  
Axle V on back of Car.



Axle H on back.



Axle V on front.

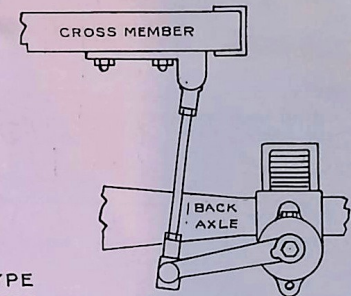
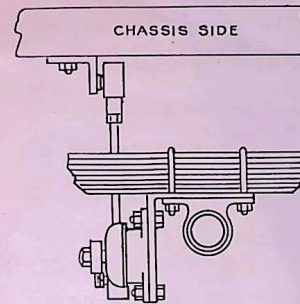
Brackets Nos. 3 & 4 (or 5 depending on width of Springs).

Bracket No. 5 (the small flat bracket bolted to Chassis to be cut by fitter. Use mild steel 3/8 in. thick).

WHEEL BOUNCING ELIMINATED

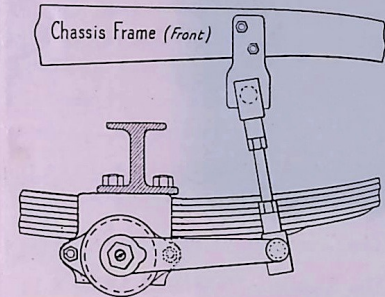
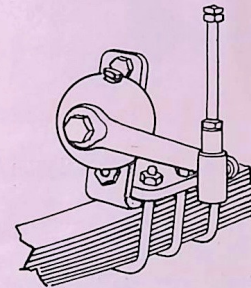
FURTHER EXAMPLES OF FITTING TO AXLE

(Continued).



AXLE V TYPE  
ON BACK OF CAR

Brackets Nos. 6 and 9 (turned downwards).



Bracket No. 8.  
Bracket on Chassis to be made by Fitter—  
(use 3/8 in. Mild Steel).  
Axle H on front of Car.

DIMENSIONS :

Although the Houdaille Patent Hydraulic Suspensions can be fitted to any Car, enquiries are sometimes made as to their measurements.

As stated earlier, there is only one model, but it is assembled in three ways purely for convenience and for accessibility (see page 8).

From Back to Front : Extreme Projection 4 1/2 in.

Width between Centres of Bolt Holes : 4 1/2 in.

Length of Lever Arms between Centres :—For Chassis Fitting : 6 in. or 7 1/4 in. (see page 8).

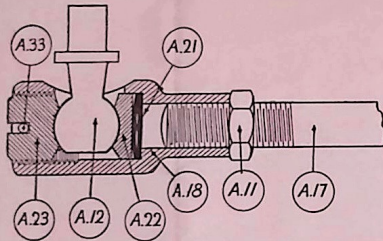
For Axle Fitting : 7 1/4 in. or 8 1/2 in. (see page 8).

WHEEL BOUNCING ELIMINATED



## FITTING INSTRUCTIONS—continued.

## ASSEMBLY OF THE BALL HEAD AND ITS COMPONENTS.



- A.18—Ball Head.  
 A.21—Spring Washer.  
 A.22—Case-hardened Ball Joint Seating.  
 A.12—Case-hardened Ball Joint.  
 A.23—Ball adjusting Castle Nut, case-hardened Seating.  
 A.33—Split Pin.  
 A.17—Connecting Link.  
 A.11—Locking Nut.

**When Assembling**, fill the Ball Head A.18 with stiff grease and tighten up Castle Nut A.23 sufficiently to avoid play.

**The Connecting Link A.17** is to be cut to desired length.

**The Shanks of the Ball Joints A.12** must be rivetted: one into the end of the Lever Arm of the Houdaille, and the other into the Fixing Bracket.

**Be Careful that the Head of Ball Joint A.12** is central in the Socket of the Ball Head A.18.

When fitted to the Car, the Ball Joints A.12—one being on top and one at bottom of each connecting Link A.17—should face in similar or in opposite directions, but never at right angles to each other, as this leads to undue wear.

**The Back Springs of a Car should be very supple.** If they are stiff it will be found advisable, so as to obtain the best results from the Houdailles, to take a leaf out from one of the Springs—the third leaf counting from the smallest is preferable—do not hesitate to do this unless the springs are quite supple, for it has been successfully done on thousands of cars with perfect results.

WHEEL BOUNCING ELIMINATED

## FITTING INSTRUCTIONS—continued.

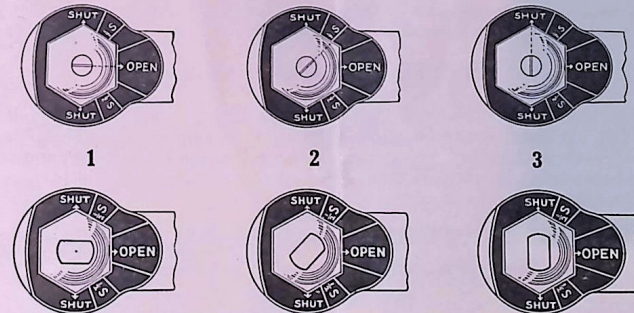
## REGULATING THE VALVES OF HOUDAILLES.

The braking power of the Houdailles is effected by the passage of Castor Oil (on the rebound of the Car Springs) through the apertures provided for this purpose. These apertures must be more or less closed or opened by means of moving the regulating rod with a Screw Driver, or a small Spanner, as the case may be, as will be seen by reference to the double paged sectional drawing, so as to correctly check the recoil of the Springs of the Car to which the Houdailles are fitted.

The correct valve setting can only be found on a road test.

The valve setting of the Houdailles fitted to the back of a Car will not necessarily correspond with the valve setting of the Houdailles fitted to the front of the same car.

The valve setting will never vary excepting at will.



**Note.**—In some series the head of the Regulating Rod projects, and, as will be noted, is flat on its upper and lower sides; in those so made, the regulating will be done by using a small adjustable spanner instead of a screwdriver.

1. Slot or flattened sides of regulating spindle (in line with arrow) pointing to the word "open." The passage for the liquid is full open, and the braking effect slight.
2. Slot or flattened sides turned a little to the right or left increases the braking power.
3. Slot or flattened sides turned to "closed" on indicator plate. The passage for the liquid is almost closed. This position is only for use in exceptional cases.

**Note.**—The slightest variation in the valve position will produce a defined result so that perfect regulation is obtainable. The indications on the regulating plate are to enable the valve setting of a pair to be alike.

WHEEL BOUNCING ELIMINATED



FITTING INSTRUCTIONS—continued.

### REGULATING INSTRUCTIONS.

The turning of this regulating Spindle by means of a screwdriver or adjustable spanner, as the case may be, away from the word "Open" (either to the right or to the left) changes the relative position of the concentric (or oval) end of the regulating Spindle, with the holes at the inner end of the main Shaft in which it is placed, and thus more or less closes these holes through which the liquid is forced on the rebound of the Car Springs. The further this is turned from the horizontal, the more these holes are closed. The slightest movement of this regulating Spindle by means of a screwdriver or spanner, as the case may be, is effective. THE PROPER VALVE SETTING CAN ONLY BE FOUND by running the Car over BAD ROAD SURFACE AND CLOSING OR OPENING MORE OR LESS WHAT IS BEST TERMED THE "VALVE," UNTIL THE BEST RESULT IS OBTAINED. Start with the valve about one-quarter closed from the "open" position.

### SYMPTOMS.

When running at any speed above 20 m. p. h., if the springs rebound too freely, close the valves slightly: run the car again, and, if necessary, close the valves a trifle more and continue so doing until Shocks are no longer felt. If, however, the valves are too much closed, it makes the springs feel as if they are nearly solid, in which case open the valves, a little at a time, until correct results are obtained, which will not vary excepting at will.

### THE RECUPERATOR CHAMBER.

When the Houdailles are delivered, the Recuperator Chamber will be almost filled with Castor Oil. It must never be allowed in use to become empty, otherwise air will enter the "working chamber," and as air is compressible, whereas liquid is not, there will not only be variation in efficiency, but the action of the Instrument will be upset with risk of breakage of the internal parts.

### TO REFILL THE RECUPERATOR CHAMBER, ONLY USE CASTOR OIL

since changes of temperature do not affect its viscosity (density).

### MAINTENANCE. MOST IMPORTANT.

After running each 3,000 or 4,000 miles, the Recuperator Reservoir must be refilled by pouring Castor Oil into it through the screwed plug. Under no circumstances must any other Oil be used.

This is the only attention required when in use, other than occasionally putting Grease into the ball joints, on top and bottom of the connecting links.

A regulating and maintenance Card is sent out with every pair of Houdailles, and must be given to the Owner of the Car to which they are fitted.

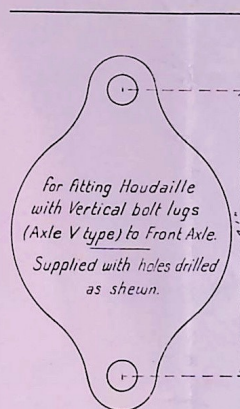
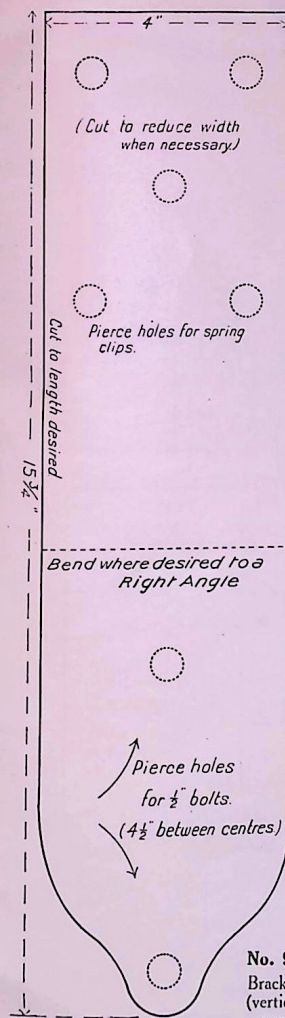
### THE BALL JOINTS ON TOP AND BOTTOM OF THE CONNECTING LINKS

If these are kept filled with Grease there should be no wear, since the ball stud and its seatings are case-hardened. If, however, play should develop, take out the split pin (A.33) (see page 14) and screw down sufficiently the ball adjusting Castle Nut (A.23) and replace the split pin.

WHEEL BOUNCING ELIMINATED

### STANDARDISED FIXING BRACKETS, $\frac{3}{8}$ -in. Mild Steel (No. 4, $\frac{1}{2}$ -in. Mild Steel)

No holes are drilled excepting as shown, on account of variations in Chassis. Cut if required to desired length or width. Bend—after heating—at desired position, as suggested by dotted lines, taking care not to crack the metal.

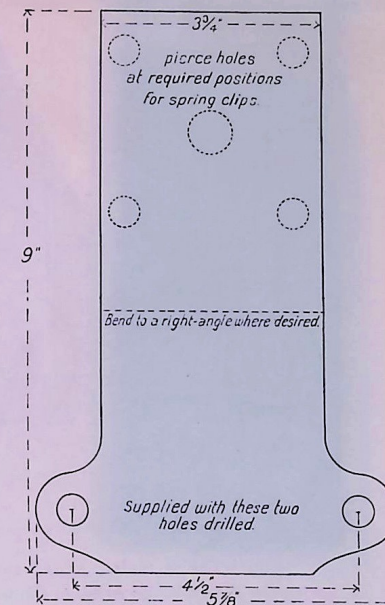


To be fitted behind suspension box, in front of axle, and used in conjunction with bracket to be forged by fitter to fit section of axle (see page 12).

No. 1. Price 7/8 per pair.

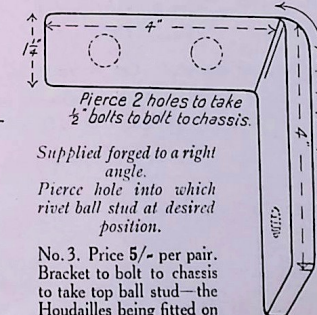
Also for Axle H Type when bolted through the front axle.

No. 9. Price 14/- per pair. Bracket for fixing Houdailles, Axle V Type (vertical bolt lugs) to Back Axle: also, in some cases to Front Axle (see page 12).



No. 8. Price 13/- per pair.

Bracket for fixing Houdailles (Axle H) to back or front Axles and Houdailles; also Chassis type to Chassis when requisite to lower them from Chassis.



Supplied forged to a right angle. Pierce hole into which rivet ball stud at desired position.

No. 3. Price 5/- per pair. Bracket to bolt to chassis to take top ball stud—the Houdailles being fitted on to the Axle.

WHEEL BOUNCING ELIMINATED

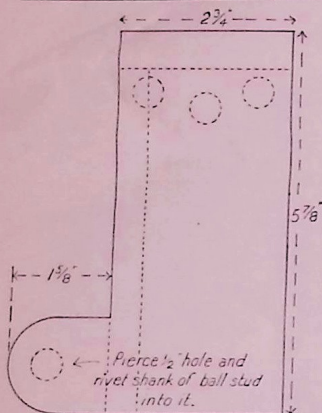


**STANDARDISED  
FIXING BRACKETS**

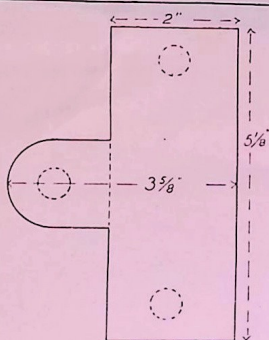
(continued),

**$\frac{3}{8}$ -in. Mild Steel**

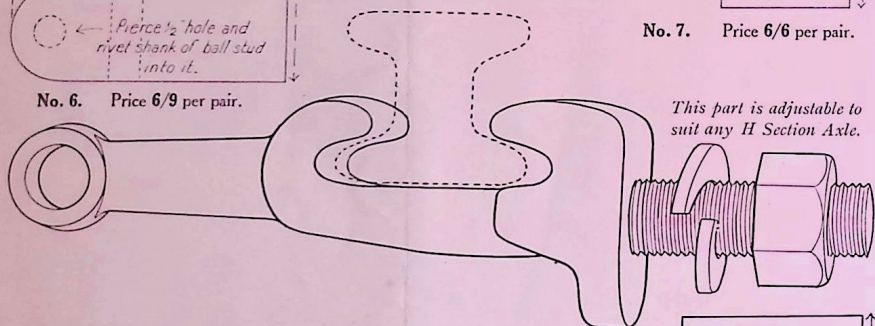
Pierce holes and bend as suggested by dotted lines. Cut to desired length or width as required. When the Houdailles are bolted to Chassis these brackets are placed on or under the spring table to secure the ball stud of the bottom ball joint, and in some cases No. 6 Brackets are bolted to Chassis where Axle type are used (see pages 12 & 13)



**No. 6.** Price 6/9 per pair.



**No. 7.** Price 6/6 per pair.



**No. 2.** Price 8/6 per pair. Complete as shown.

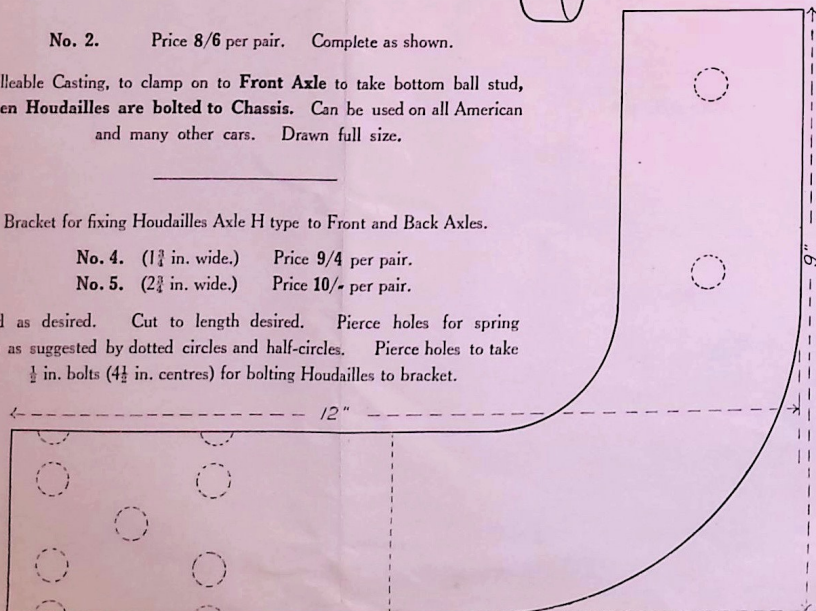
Malleable Casting, to clamp on to **Front Axle** to take bottom ball stud, when Houdailles are bolted to Chassis. Can be used on all American and many other cars. Drawn full size.

Bracket for fixing Houdailles Axle H type to Front and Back Axles.

**No. 4.** ( $1\frac{1}{2}$  in. wide.) Price 9/4 per pair.

**No. 5.** ( $2\frac{1}{2}$  in. wide.) Price 10/- per pair.

Bend as desired. Cut to length desired. Pierce holes for spring clips as suggested by dotted circles and half-circles. Pierce holes to take  $\frac{1}{2}$  in. bolts ( $4\frac{1}{2}$  in. centres) for bolting Houdailles to bracket.



**WHEEL BOUNCING ELIMINATED**

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# WHY CAN'T YOU SHOOT A FISH?

Take a high-power rifle that will kill an elephant, and with it try to shoot a fish lying at the bottom of four feet of water. Not a chance. The bullet will lose its force half way down. **NOTHING CUSHIONS A SHOCK LIKE A MOVEABLE LIQUID.**

That's the whole secret of the Houdaille Shock Absorber—castor oil confined in Chambers, and escaping to other Chambers in direct proportion with the amount of shock absorbed.

So, gently but firmly, HOUDAILLE lays its restraining hand on all shocks alike, from the slight road ripple to the racking bounce of the unexpected rut.

They can't come too quick or too varied for HOUDAILLES. The great hydraulic principle compensates for all spring over-action or under-action, and smothers all shocks alike.

Another thing for you Motorists to remember about springs: The manufacturer rightly puts on your car springs

built for the Car's biggest task—springs that will mean comfort at full speed with the car loaded to full capacity.

So when you and your wife take the car out alone, those same springs over act. They "throw you" with every shock.

## BUT NOT IF YOU'RE HOUDAILLE EQUIPPED.

HOUDAILLE makes springs adaptable and versatile—they hold the spring power but dampen the "throw."

Of course you know what that means. All four wheels on the ground all the time—full speed around curves—more power out of your engine—more life to your tyres.

That's nerveless Motoring, by the way. That's coming home after a hundred and fifty miles refreshed and invigorated. Such a little thing to add so much to car service. Put HOUDAILLES on first chance you get.

*Reprinted from The Illustrated London News, June 17, 1922.*

## HYDRAULIC SHOCK - ABSORBERS.

*The following article from the pen of Mr. W. Whittall, the well-known motoring authority and correspondent is sent you with justifiable pride.*

SHOCK-ABSORBING devices are rather a hobby of mine, mainly for the reason that, as I have said before in these notes, I consider that in no case, however good the suspension of the car, can they fail to effect some improvement. In most cases the improvement will be very substantial, while in a great many their use is absolutely essential if the passengers are to travel in anything like reasonable comfort, to say nothing of the longer tyre and chassis life ensured by the use of some adequate device for taking up road shocks. Some months ago, when writing on the subject of shock-absorbers generally, I expressed a tentative opinion that the hydraulic type was, perhaps, not the best suited for use on small, light cars. This opinion was the result of a not very extended trial on a light car, in which no particular care would seem to have been expended on the adjustment of the shock-absorbers, and on a rather longer trial of one particular type on my own car. My views on the subject brought me a long and very courteous communication from the manufacturers of the Houdaille hydraulic suspension, in which, needless to say, those opinions were subjected to considerable criticism. The end of it was that I had my car fitted with a complete set of four Houdaille shock-absorbers, and have been using them ever since. At the same time, I have been at a good deal of pains to observe carefully the behaviour of other cars of similar type and weight when fitted with other types of shock-absorbing devices, particularly those which depend upon friction brakes for their effect, and have now arrived at some very definite conclusions. I may say at once that I was quite wrong in my deduction that the hydraulic type is not the best suited for small cars. It is all a matter of adjustment. You can make them anything, from the ideal suspension to something which falls very far short. What I have found is that if sufficient care is taken to make the very simple adjustments necessary (and they can be made in a couple of minutes for the complete set), the hydraulic type, of which the Houdaille is the outstanding example, is by far the best. There is a softness of action which is absent from the effect of the friction-brake type, which simply seems to stiffen the springs. The hydraulic permits the spring to flatten under shock and merely absorbs the recoil—a characteristic which I consider excels by far the checking of the spring movement both ways. Thus one gets a sense of cushioned riding which is easily differentiated from the comparative harshness of the friction-brake type. Not that the latter is not quite good. It is; but it falls short of the other in a way that is not easy to describe in writing, but which can be appreciated immediately on practical test. There is nothing like an extended trial to convince one. I have now had these Houdailles on my car for some four months, in which I have travelled about as many thousand miles, as well as a considerable mileage on cars fitted with other types of shock-absorber. My deliberate conclusion is that the hydraulic type is quite definitely superior to the other, and I tender my thanks to Messrs. Houdaille for having given me the opportunity of proving my first opinion to be in error. I cannot be fairer than that.

W.W.

*Apply for detailed particulars and free month's trial to—*

## The Houdaille Hydraulic Suspension Co.

LTD.

41 New Bond Street, W.1

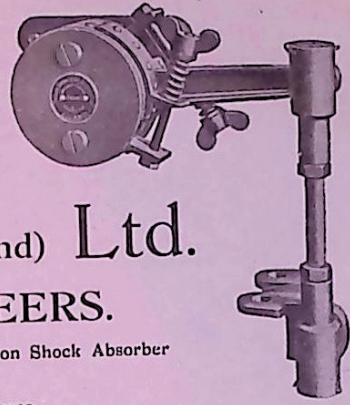
Phone :—Mayfair 6267.

Wire :—Houdaille, Phone, London



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F.S. PRIVATE.

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ELLAND.



# Frank Smith & Co., (Elland) Ltd.

## AUTOMOBILE ENGINEERS.

Patentees and Sole Manufacturers of the "SMITH" Patent Coil Friction Shock Absorber and Rebound Damper.

(REF) F.S./D.R.

Enclosures.....



To Esmond E. Johnson, Esq.  
Maescourt,  
Malganhead,  
Berks.

Oct. 3rd. 1922.

Dear Sir,

We thank you for your inquiry of the 2nd. <sup>which is</sup> certainly interesting and we see no reason why our absorbers should not answer your requirements as they eliminate all wheel-slip and bouncing on cars of all sizes, when travelling at maximum speed, over rough surface. If you can let us have a drawing or photograph of the machine, we could make suggestions as to how you could fit them.

We should, however, suggest 2 of the large size, such as we use on racing cars and commercial vehicles.

In the event of your placing an order with us for this duty, we are prepared, should they be found of no benefit, to take the absorbers back & refund, in full, all money paid to us.

We trust to hear from you favourably as we are naturally interested in their application to other types of machinery.

Yours faithfully,

Per Pro. FRANK SMITH & CO., (ELLAND) LTD.

M.P.



(C O P Y)

J/MW. Mon:2:Oct:22.  
Messrs Frank Smith & CO., (England) Ltd.,  
Dear Sirs,

MOTOR ADV.

I have seen your advertisement in the above, and if your appliance eliminates bounding, can it be incorporated upon a Vehicle running at 100 to 120 M.P.H. upon a Mono-Rail. The weight of the Vehicle would be approximately 1 ton to 25 cwts, and there would be 2 Track Wheels provided with steel treads and double flanges. The power, namely, 100 H.P. is large in proportion to the weight, hence the fear of bounding.

Yours faithfully,  
(sgd) Edmond E. Johnson.



MEMORANDUM.

MAESCOURT,  
MAIDENHEAD,  
BERKS.

Captain B. Crossley Meates,  
Larklands,

REFERENCE.

J/NW.

ASCOT,

BERKS.

Wed:4:Oct:22.

Dear Captain Crossley Meates,

I am still trying to eliminate the Pilot Wheels for the Demonstration Car, as the laying of a 3 mile Track would thereby be reduced to perhaps 1/10 the cost.

You will observe by the advertisement attached to this letter that the Houdaille Hydraulic Suspension Co., Ltd., claim "WHEEL BOUNCING ELIMINATED".

I enclose you their letter and Catalogue received this day, together with a letter from Frank Smith & Co., Ltd., who make a somewhat similar contrivance, the latter offering to take back their apparatus if unsuitable.

Perhaps you would give this matter your consideration and say if you think the idea is feasible.

Yours sincerely,

*Edmund B. Johnson*



1. Advertisement of Messrs Houdaille Hydraulic Suspension Co., Ltd.,
2. Copy of P.C. to Messrs Houdaille Hydraulic Suspension Co., dated the 2nd inst., with their reply.
3. Copy of P.C. to Frank Smith & Co., Ltd., dated the 2nd instant, with their reply.
4. Catalogue from Messrs Houdaille Hydraulic Suspension Co., Ltd.
5. Pamphlet from Frank Smith & Co.,



Phone: MAIDENHEAD, 297.

/ EDMOND E. JOHNSON,  
MAESCOURT,  
MAIDENHEAD,  
BERKS.

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,

REFERENCE.

ASCOT,

J/MW.

BERKS.

Fri:6:Oct:22.

Dear Captain Crossley Meates,

I enclose you another letter from Messrs The Houdaille Hydraulic Suspension Co., Ltd., received this morning. Possibly we can settle this question this week-end, if you can see me either at Ascot or here.

The Martini is going into dock, owing to a knock which has suddenly developed in one of the big ends.

With best wishes,

Yours sincerely,

*Edmond E. Johnson*



Letter from The Houdaille Hydraulic Suspension Co., Ltd dated the 5th instant.



Houdaille Hydraulic Suspensions have been recently fitted to the following cars:—

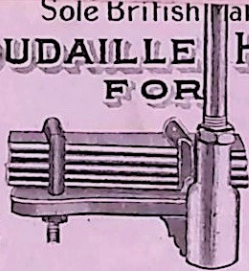
H.M. Queen Alexandra's Daimler  
H.R.H. The Prince of Wales's Rolls Royce  
H.R.H. The Duke of York's Armstrong Siddeley  
H.R.H. Prince Henry's Armstrong Siddeley  
H.R.H. The Duke of Connaught's Daimler  
H.R.H. Princess Beatrice's Lancia

TELEPHONE:  
MAYFAIR 6267.  
TELEGRAMS:  
HOUDAILLE · PHONE · LONDON.



**HOUDAILLE SUSPENSION CO. LTD.**

Sole British Makers and Concessionaires of the Patent  
**HOUDAILLE HYDRAULIC SUSPENSIONS**  
FOR MOTOR CARS.



*The only known method of  
Automatically adapting Motor  
Car Springs to the varying  
conditions of road surfaces.  
Add 25% to the life of Tyres  
by always keeping the Wheels on  
the road.*

Offices and Show Rooms —  
41, New Bond Street, LONDON, W.1.

C.D/R.D.

5th October, 1922.

E.E. Johnson, Esq.,  
Maescourt,  
Maidenhead,  
BERKS.



Dear Sir,

Replying to your favour ref. J/MW. of yesterday's date we should be quite prepared to make a concession on the lines of the copy unnamed letter which you sent us.

We would point out, however, that we only make one size Suspension so far as the Suspension box is concerned but we market different lengths of lever arms. If you will glance at the two page line drawing in the catalogue sent you on the 3rd you will appreciate at once that increasing the size of the Suspension box would not increase the efficiency and that <sup>the</sup> only object of the longer lever arms is to prevent contact between the rotating impeller and the stationary re-acting member.

We are not quite certain if on the 3rd we sent you the cata-

ENCLOSURE  
N<sup>o</sup> 462



logue published in February of this year or our second edition just published so enclose a copy of the latter and on Page 8 you will see our standard lengths of lever arms mentioned and on Page 19 the lengths that should be used for a given spring travel. If our maximum length should not suffice it would not be a difficult matter to make up special length lever arms for you.

In friction type shock absorbers size is of importance owing to wear that takes place and we are of the opinion, therefore, that the copy unnamed letter you sent us refers to a friction type shock absorber, the working of which must not be confused with a hydraulic device such as ours in which the efficiency never varies, the setting of the valve remains constant and wear is absolutely negligible.

Yours faithfully,

THE HOUDAILLE HYDRAULIC SUSPENSION CO., LTD.



ac: MAIDENHEAD, 297.

**EDMOND E. JOHNSON,**  
**MAESCOURT,**  
**MAIDENHEAD,**  
**BERKS.**

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,

REFERENCE.

J/MW.

ASCOT,

BERKS.

Mon:16;Oct:22.

Dear Captain Crossley Meates,

Many thanks for your letter of the 14th inst., I forgot to mention to you that in addition to the Shock Absorber and Re-bound Damper I suggest the employment of Elevators both fore and aft of the Vehicle. If there were any tendency to bound these Elevators can be thrown into action and would in effect give the same result as the Pilot Wheels, however, before arriving at a decision upon this most vital matter, I think a discussion is essential, but this can of course stand over until an opportunity presents itself which is convenient to you.

In regard to the Smith Shock Absorber, Mr. Frank Smith is due back from the Continent to-morrow, when he is going further into this matter. As soon as I hear I will forward you on a copy of his letter.

I have been unable to trace the Hartford Snubber, as they do not advertise in either the "Motor" or the "Autocar", nevertheless, I gather from your letter that although this is the one at present used in the racing world, you recommend the Smith Snubber in preference.

With kind regards,

Yours sincerely,

*Edmond E. Johnson*



Houdaille Hydraulic Suspensions have been recently fitted to the following cars:—

H.M. Queen Alexandra's Daimler  
H.R.H. The Prince of Wales's Rolls Royce  
H.R.H. The Duke of York's Armstrong Siddeley  
H.R.H. Prince Henry's Armstrong Siddeley  
H.R.H. The Duke of Connaught's Daimler  
H.R.H. Princess Beatrice's Lancia

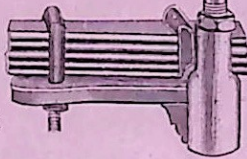
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MAYFAIR 6267.  
TELEGRAMS:  
HOUDAILLE-PHONE-LONDON.



HOUDAILLE HYDRAULIC SUSPENSIONS CO. LTD.

Sole British Makers and Concessionaires of the Patent  
**HOUDAILLE HYDRAULIC SUSPENSIONS**  
FOR MOTOR CARS.

*The only known method of  
Automatically adapting Motor  
Car Springs to the varying  
conditions of road surfaces.  
Add 25% to the life of Tyres  
by always keeping the Wheels on  
the road.*



Offices and Show Rooms  
41, New Bond Street, LONDON, W.1.

C.D/R.D.

12th October, 1922.

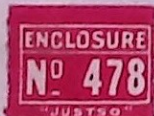
E.E. Johnson, Esq.,  
Maescourt,  
Maidenhead,  
BERKS.

Dear Sir,

Replying to your favour J/MW. of yesterday's date we have no record of the weight of the 200 h.p. Benz which put up so many world's records before the War, but it would probably be in the region of about 30 cwt. Certainly much heavier than racing cars are built today.

The Houdaille Suspensions which were fitted to it most certainly kept the four wheels in continuous contact with the track at all speeds. In our opinion wheel bouncing is simply due to unchecked recoil and it does not concern us whether pneumatic or steel tyres are fitted.

We cannot discuss the question of wheel bouncing if springs were abolished, but frankly we cannot conceive any vehicle of any type in motion on the ground with the interposition of some form of spring between the axle and chassis frame; or alternatively purely hydraulic springing. We do not think that your wheels being trailing wheels makes any difference as we get just the same results from the front wheels of a car as from the back.





The sprung part of any vehicle is a certain factor, and the more weight that rests on the springs, so ~~it is~~ this extra weight assists in checking the rebound; that is why a car always travels better with a full load than a light one. It is impossible, however, to fit any vehicle with springs with a fixed anchorage that, if sprung enough for the maximum load, do not produce an excessive rebound with the minimum load. Hence the desirability of a device such as ours. This is probably one of ~~the~~ causes why we command such large sales.

Short wheel base does not, in our opinion affect wheel bouncing, but merely makes it more apparent. The last paragraph of your letter is interesting inasmuch as at high speeds our Suspensions show their efficiency far more than at low speeds; the action of the spring being much quicker.

As regards your post script, our valve setting gives complete range, but it might be, on commercial vehicles you would have to use 2 pairs in order to get the strength required on the checking of the recoil.

We cannot, of course say whether our or any one elses shock absorbers (better defined as rebound dampers) are going to answer your purpose, but we can say that if a rebound damper is going to answer your purpose you will find the Houdaille the best and certainly most efficient. In fact its efficiency is absolutely constant.

Yours faithfully,

THE HOUDAILLE HYDRAULIC SUSPENSION CO., LTD.



Phone: MAIDENHEAD, 297.

**EDMOND E. JOHNSON,**  
**MAESCOURT,**  
**MAIDENHEAD,**  
**BERKS.**

MEMORANDUM.

Captain B. Crossley Meates,  
Larklands,

REFERENCE.

J/MW.

ASCOT,

BERKS.

Fri:20:Oct:22.

Dear Captain Crossley Meates,

I propose calling for the Model to-morrow morning, unless I hear from you by phone that this is inconvenient.

The bus I propose coming by is due at Ascot at 11.37.

I enclose you letter received from Houdaille Suspension Co., Ltd., and Brown Brothers, re Snubbers.

Yours sincerely,

*Edmond E. Johnson*

*I am pleased to inform you that I have just heard the American Patent has been allowed, with the 13 Claims.*



Letter from Houdaille Hydraulic Suspension Co., Ltd. dated the 17th instant.

Letter and Leaflet from Brown Brothers, Ltd., dated 19th instant.



297.

MEMORANDUM.

**E. JOHNSON,**  
**COURT,**  
**MAIDENHEAD,**  
**BERKS.**

Captain B. Crossley Meates,  
Larklands,

REFERENCE. ASCOT,  
J/MW. BERKS.

Thur:26:Oct:22.

Dear Captain Crossley Meates,

In reference to the suggested appointment for Sunday next, I presume after Lunch will be the best time, either here or at your address. On hearing from you I will communicate with Mr. Williams, 48, Queens Road, Windsor.

I enclose letter received from Messrs Frank Smith & Co., Ltd.,

I am now making a new Model on the lines suggested by you, with, I think one or two improvements. For the Outer Track Wheels I suggest treating these in a similar manner to the Mono-Rail Track Wheels, namely, by providing stub axles with leaf springs on either side.

When the Bogies have to be tackled, there is one Bogie Patent I understand ~~is~~ still in force, which I shall have to watch very carefully, namely, that of Louis Brennan. (Patent No. 29,579/09). Distribution of load over a number of wheels, axle boxes and braking. X

With best wishes. Hoping to see you soon.

Yours sincerely,

*Edmund E. Johnson*

X Axle Boxes page 7. Brennan.

ENCLOSURE  
NO 521  
"HUSTON"

Copy of letter from Messrs Frank Smith & Co., dated the 23rd instant.  
Louis Brennan's Patent No. 29,579/09.



Crossley Meates,  
Larklands.

(C O P Y)

Frank Smith & Co., (Elland) Ltd,  
Huddersfield Road,  
ELLAND.

(REF) F.S./D.R.

Edmond E. Johnson, Esq.,  
Maescourt,  
Maidenhead,  
Berks.

Oct. 23rd, 1922

Dear Sirs,  
Further to your letter of the 11th and our reply of  
the 13th .

In answer to your first query, we might say that a  
200 H.P. car running at Brooklands at 130 M.P.H. with our large  
size Absorbers at the Rear and Medium size in front, will hold  
the track perfectly, even over the worst bumps.

Bouncing is caused solely by irregularities in the  
track.

As a car emerges out of a depression, the laminated  
springs are, naturally, compressed and, if no dampers are fitted,  
the springs will rebound far beyond their normal position, tend-  
ing to lift the car from the track and will continue to oscillate  
for some time during which period the driving wheels will spin  
and the car is difficult to handle.

When dampers are fitted the springs are prevented from  
giving back the energy they have stored up on compression and  
are brought to rest at normal position, thus preventing the load  
being thrown upwards. We do not consider that pneumatic tyres  
would increase bouncing.

Speed is certainly the ruling factor, both in the case  
of a motor car on Brooklands track and a vehicle running upon a  
Mono rail. The greater the speed, the greater the spring de-  
flexion, therefore, the greater the rebound. That is, if a car  
travelled over a depression in the road, say 3" deep, at 40 miles  
per hour, the springs would compress, say, 3", whereas at 100  
M.P.H. over the same hole, the springs would compress, say, 6" to  
8" with the result that the rebound would be so great as to raise  
the car from the ground and would continue oscillating for some  
time afterwards. If the steel rails are perfectly free from  
irregularities, there would be no fear of bouncing even without



Absorbers, neither would the cars on Brooklands track bounce if the track was free from depressions, but, if the springs of your vehicle are flexible enough to absorb the Shock from small depressions, you would find, at 120 m.p.h. a fair amount of bouncing or oscillation. If you fit Absorbers the springs would be allowed to compress and absorb the initial shock but they would not rebound beyond their normal position. Thus, there would be no bouncing and no tendency to increase the irregularities of the steel rail.

We are confident that you can fit our Absorbers to your Mono-Rail Vehicle with equal advantages to those obtained on a large car, running at 130 m.p.h. on Brooklands track.

We enclose copy of our new Catalogue from which you will note that, in addition to controlling the Rebound, you can stiffen the springs by another adjustment, to any desired degree.

Trusting to hear further from you,

We are,

Yours faithfully,

Per Pro. FRANK SMITH & Co.,  
(sgd) D.R.