Steam Car Developments and Steam Aviation

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The Steam Driven Aeroplane.

Steam has at last triumphed in the air the successful flights that have taken place at Oakland in California have prove beyond the shadow of doubt that steam is destined to play a most important part in the history of aeronautics.

It is little to be wondered at that experts are watching the progress of this invention of the Besler Brothers with keen interest, when one realizes what it means to Aviation to possess a silent 'plane capable of being started up by simply closing a switch in front of the pilot, which without any other effort or thought on his part, starts the burner appraises the required working pressure of steam in the generator, in the space of thirty seconds or so—sufficient to send the airscrew whirling at 1,625 revolutions per minutes.

This is what has been accomplished, and it can be done in the coldest of weather with equal certainty every time. As most people know this cannot be done in frosty weather on an ordinary motor car, with any degree of certainty, and without as severe tax upon the starting battery.

Again the steam propelled 'plane uses a fuel of high flash point, non-explosive, and so safe in use that half the terrors of flying disappear straight away. Petrol, as a fuel, is just about the most dangerous thing to be carried on any machine—particularly in the air, where, if a conflagration takes place, there is little hope for either the pilot or passengers, except by parachute; and no hope for the machine itself, to say nothing of a crash which so often ends in the occupants being roasted alive.

But safety and silence in the air are not all that is to be gained by using steam as a motive power. As we mentioned in "S.C.D. & S.A." last month, it is impossible to stall a steam engine in flight, it has the capacity of holding on. It is also unaffected by atmospheric conditions, and I capable of developing its full power at low rates of revolution so that the working parts of the engine are much more likely to give out under actual working conditions. This means for a correspondingly longer life, and a lower cost of maintenance.

The Besler Brothers demonstrated to the full the advantages of the steam engine's ability to reverse instantly its air-screw n flight, and the extra safety and ease of handling which that important aspect gives. It is all too well known how ruinously extravagant the modern petrol engine is, both in fuel and lubricating oil. Here the steam engine scores as its lubrication costs are

negligible, and it can see the cheapest of fuel. Apart from this, one of the other troubles of the I.C. Engine in flight is the elaborate precautions which have to be to keep lubricating oil at a reasonable temperature, and this been a considerable source of worry to designers. The steam engine does not suffer in this respect, the lubricating oil is not contaminated in use, and as the crankcase completely isolated from the working cylinders, the oil in it does not rise in temperature, even on the longest runs.

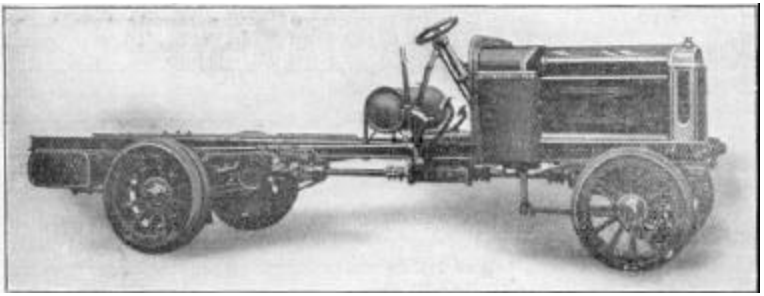
With the I.C.E. driven aeroplane, flying at height, rarefied atmospheres are encountered, superchargers have been brought into requisition, and—even where this complication has been added—it never completely prevents the loss of power which occurs at high altitudes.

In our last issue we described how the silence of the steam driven 'plane was appreciated by all who witnessed the flight. How the calls from the pilot were heard by the crowds below, and their replies received in turn by the pilot. What these silent steam-driven 'planes eventually mean for military purposes, can be readily understood.

The conditions for the efficient working of a modern steam plant in the air are ideal, under almost all circumstances The condensing of, the exhaust steam from the engine is rendered easy, and as nearly perfect as it is possible to get in any steam plant, far more so than in a steam driven motor car, where the air current available for condensation is so much less powerful.

In the current, issue of the “Engineer" one reads an advertisement by a firm of boilermakers which stresses the fact that no boiler should be dependent on any one variety of fuel–it should be capable of using anything combustible, in the nature of coal, or oil, or wood. We quite agree with that statement, particularly where the Royal Navy is concerned, all our fighting ships are fitted out for oil-firing only, and as this country depends largely upon foreign oil supplies, which, in the event of war are liable to be interrupted, the practice seems distinctly dangerous. Now let us look ahead a little; we already have aeroplanes flying over vast stretches of forest land, and open plains–where petrol is quite unavailable. We can see the time coming when a light steam generator will be designed in which the oil burner can be quickly removed, when necessary. Then in an emergency–where a 'plane has had to come down through fuel shortage–the journey could be continued with the aid of wood fuel firing.

Lady Bailey, in her long flight some years ago, mentioned flying for several days over the tree tops of huge forests. Had her petrol given out over this region, it would have spelt death to the occupant of the machine, but had it been necessary for her to land in a partially cleared area, and presuming she did so without a crash, petrol supplies would most certainly not have been obtainable. The pilot of a steam 'plane with an interchangeable firebox would, in such an emergency, be able to collect sufficient wood fuel to enable him to take off again, and continue on his way. These are just a few ways of looking at our future, but such days will most certainly come, and may come soon.



Several readers have asked us to publish an illustration and description of the Critchley-Norris Steam Omnibus of 1908–a vehicle of advanced design for that period–and we do so herewith. Mr. Kitchen, the designer has kindly supplied the illustration, and we are indebted to the "Commercial Motor" for the description.—Editor.

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The Critchley-Norris Motor Company.

A NEW STEAM SYSTEM FOR LORRY AND OMNIBUS WORK Exhibited at Olympia Show, March, 1908.

A very interesting and a certainly novel steam bus or lorry chassis is shown on the stand of the Critchley-Norris Motor Company (a branch of Peter Pilkington, Limited), of Bamber Bridge, near Preston. This machine embodies many of the best ideas of other makes of steam vehicles, together with many features which are original. In appearance, the machine resembles a petrol-propelled chassis. The three-cylinder, vertical steam engine is situated under the bonnet, and immediately behind this is a hood which covers the generator. From the engine, the power is transmitted through two short cardan shafts, to a differential countershaft, and thence, by side chains, to the rear wheels.

The three cylinders of the engine, which, by the way, is a single-acting one, are cast in one piece with the valve boxes. The pistons are first ground parallel to ensure cylindrical form, and the upper portions are then ground slightly tapered, so that there is less chance for the pistons to score the cylinders owing to the unequal expansion of the metal when under the influence of super-heated steam. Each piston is fitted with seven piston rings; between the fourth and fifth rings there is an annular groove, which communicates with the atmosphere, in order to allow any steam, that may pass the top four rings to escape instead of being allowed, to find its way into the crank case, and there to condense and interfere with the working parts: similarly, the three lower rings

and the annular groove; prevent an excessive amount of lubricating oil from passing into the cylinder, and being carried from thence to the condenser. The inlet and the exhaust valves are arranged at opposite sides of the cylinders, and they are operated by cams, in the same manner as those of a petrol engine; by moving the camshafts along in the direction of their lengths, the point of cut off may be varied from a full stroke to about 25 per cent. of cut off, and, by the same means, the engine may be reversed. The normal speed of the engine is 500 r.p.m., and at that speed it develops about 35 h.p., but it may be accelerated to 800 r.p.m.

The condenser occupies the front end of the bonnet, and is of the gilled-tube type, with top and bottom vessels connected by vertical tubes. The top vessel contains a feed-water heater coil, and, in the bottom vessel, two oil filters are fitted; these filters may easily be removed for cleaning. Behind the condenser, a large fan is mounted, and this is driven by a light, Hans Renold chain. The fan serves a treble purpose: it allows a current of air through the condenser; it keeps the burner supplied with sufficient, air to support combustion; and it creates a draught for the purpose of carrying away the products of combustion.

The design of the steam generator is a compromise between the water-tube and the flash types–a combination which, we might, add, has proved, in actual working, to be a very practical and efficient one. It consists of a central cylindrical vessel, around which a series of external coils of mild-steel tubes are arranged. Each coil has three complete turns, and their ends are expanded into the central vessel. A feed-water heater is coiled round the central vessel, above the water-tubes; whilst below the latter, and surrounding the burner, a superheater coil, proportioned to raise the temperature of the steam to 600 degrees Fahrenheit, is fitted, and is connected up between the throttle valve and the engine. The body of the generator partly projects through the dashboard, under the: bonnet, and the remaining portion is covered by means of a neat sheet-steel casing, as shown in the illustration which we reproduced on page 41 of our last issue. The casing is easily removed and, by undoing eight bolts, the generator can be lifted away from chassis.

The burner consists of a single jet, from which the fuel issues in the form of gas, having previously passed through a vaporiser. The flame from the jet strikes an inverted cone-shaped deflector, and the latter fitting causes the flame to spread out into a thin film, in which form the fuel takes up sufficient air for its complete combustion. The regulating needle, which rises or falls inside the jet piece, is the only movable part contained in the burner.

The fuel tank is situated under the driver's seat and is constructed to withstand a pressure of 30 lb. per square inch, at which pressure the paraffin is fed to the burners. The water tank is carried below the frame, and behind the back axle.

A short, cardan shaft transmits the power from the engine to a claw coupling which is contained within an oil-tight case, situated under the driver's seat: this casing also contains a pair of skew gears which drive at reduced speed,

a double-throw crankshaft, and from this the water and air pumps are driven. Ball-thrust bearings are fitted to both the shafts within this gear case, and the whole of these parts work in a lubricating medium. Another short cardan shaft, is employed to transmit the power to the differential shaft. All the transmission-shafts are mounted on Hoffmann ball bearings.

From the above description, it will be seen that there are no parts under the body-work which are likely to require any attention or adjustment. All the power plant is arranged forward of the body, and the only parts which are placed behind the generator are the two pumps; and their driving mechanism. The water pump supplies the necessary amount, of water to the generator, and the amount can be regulated by means of a small lever which is situated below the steering wheel. The air pump supplies the pressure under which the fuel is fed to the burner, and the lubricating oil to all the bearings. Both these pumps are readily accessible when the footboards between the driver's seat and the back of the generator are removed.

The remainder of the chassis is built on well-tried motorbus lines, and the materials include some of the best brands of steel and bronze that it is possible to procure. Although this is an entirely new steamer, its maker has had no difficulty in finding a purchaser. The Rossendale Division Carriage Company, Limited, of Bacup, will shortly take delivery of this chassis. We hope to be able to reproduce a selection of detail photographs and drawings of this interesting vehicle, as soon as the pending patents have been settled.

The marked absence of any machinery beneath the bus body, and the placing of the complete power plant forward of the dashboard, will at once commend themselves to those who have experienced, in other steam vehicles the objectionable transmission of heat from the engine or generator, to the body of the vehicle. If the engine, generator, and burner prove to be reliable and economical, we shall expect to hear that much useful work has been done by this chassis.

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New Steam Driven Vehicles.

TRANSLATED FROM THE GERMAN "V.D.I." MAGAZINE.

The following article contains a description of a new method of using high-pressure steam for the propulsion of vehicles which through the completely automatic control of pressure and temperature may have far-reaching consequences.

The application of the new method to road and railway vehicles and to boats, and the results obtained by experiments, are recorded. This remarkable technical development is of special significance with regard to German fuel oils whose consumption it should greatly increase.

STEAM CAR DEVELOPMENTS

About three years ago an American private car was exhibited in Berlin which attracted great attention. It was a steam car with 100 atmosphere working pressure, with a completely automatic regulation of steam pressure, fuel and condensation, and which exhibited road qualities that users of motor cars had not previously experienced. The car was built by the brothers Doble who in California had for many years been engaged in the construction of steam cars, and so impressed were Messrs. Henschel & Son, Kassel and A. Borsig, Berlin, with its potentialities that they at once took steps to acquire manufacturing rights in Germany, for the further exploitation of the Doble brothers inventions. That was two years ago and the first steam cars for road and rails are already being tried out, and a comprehensive survey of the present position can now be undertaken.

Private Cars. The original steam car was built by Doble in 1929. The power amounts to about 80 horse and the impulse is conveyed through a two-cylinder compound engine on the back axle. Henschel also possessed a touring car, which not only differed in many details from the Doble car but had a four-cylinder engine. This showed with a net weight of 2.3 tons an effort of about 120 horse, and on trial runs had reached a speed of 150 km. A more surprising result was the fact that the consumption of about 29 litres Benzine or 24 litres Gas-oil per 100 km. at an average speed of 70 km. per hour was not higher than in the case of a car of similar power with a compressor-motor. The car had an acceleration of 2.7 m.s squared determined by actual measurements. Since no control handles are necessary, and as this car is accelerated simply by means of a foot control a very high average speed can be obtained even at a moderate maximum. The water storage is sufficient for a journey of about 400 km but the consumption varies with the time of year, and in summer is somewhat greater, since the condenser has been kept small out of regard for the general appearance of the car. One must therefore occasionally get further supplies of water as well as fuel.

The working of the car. First of all the working of the car must be explained. See the illustration. The generator consists of a continuous run of serpentine tube made in sections which fold back on one another and which are connected by welding. This is fixed in an insulated casing in the front of the car under the bonnet. The water enters from below, while the burner is on top, so that the transmission of heat may be regarded as a stream flowing in an opposite direction. The gases are enclosed and discharged underneath. Evaporation is produced by means of an automatic contrivance which corresponds at all times to the consumption; the water and fuel consumption therefore requires no attention, and with a very small water content (about 10 litres with the 89 horse) the result is obtained. This makes it possible to start the engine in two minutes from cold.

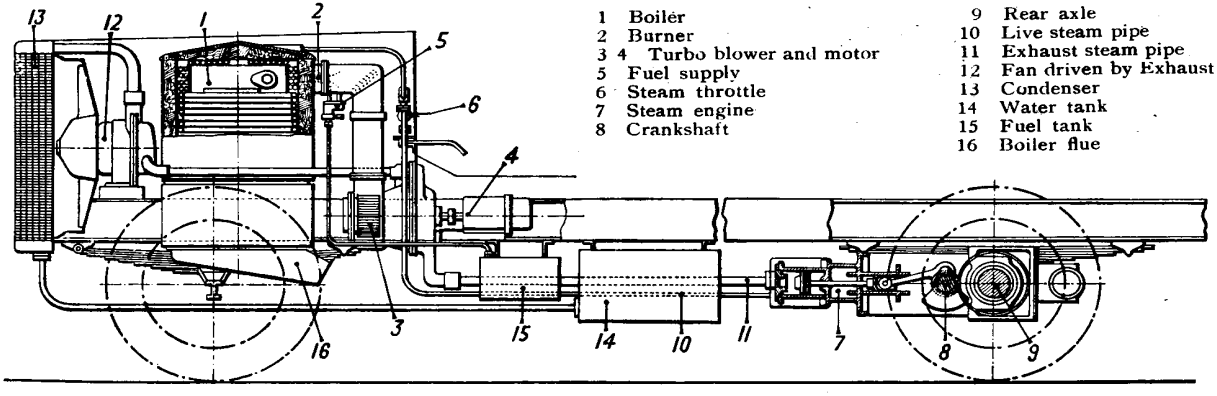
The steam, regulated by a foot control, is conducted, through flexible pipes to the engine on the axle. The engine works over an opening directly upon a large gear wheel which encloses the differential. The exhaust steam by means of two auxiliary turbines of which one drives the air blast and the other the

Table 1.—Comparative Weights of Steam, Petrol and Diesel Omnibuses (22 seated, 15 standing in each case).

	Steam	Petrol	Diesel
Weight chassis	5 tons 1 l 4 c	4 tons 16 c	5 tons 3 l 4 c
Weight body	1 t 19 c	1 t 19 c	1 t 19 c
Weight fuel	441 lbs	441 lbs	441 lbs
Weight water	331 lbs	77 lbs	77 lbs
Weight running order empty	7 t 7 c 2 q	7 tons	7 t 7 c 1 q
Weight fully loaded	10 t 1 c 1 q	9 t 14 c	10 t 1 c
Weight of passengers per cent of total weight	25 l 4 per cent	26 l 4 per cent	25 l 4 per cent
Weight in running order per passenger	448 lbs	425 lbs	448 lbs

Table 2.—Fuel Consumption and Costs of Petrol, Diesel and Steam Buses.

	Fuel Oil	Gas Oil	Petrol Benzol Mixture
Price, pence per gallon	5.3	6.8	18.2
Miles per gallon :			
Petrol Vehicle	—	—	5
Diesel Vehicle	—	6.75	—
Steam Vehicle	4	4	—
Fuel Cost :			
Petrol-benzol pence per mile	—	—	3.6
Diesel, pence per mile	—	1.0	—
Steam, pence per mile	1.3	1.7	—



1 Boiler
2 Burner
3 4 Turbo blower and motor
5 Fuel supply
6 Steam throttle
7 Steam engine
8 Crankshaft
9 Rear axle
10 Live steam pipe
11 Exhaust steam pipe
12 Fan driven by Exhaust turbine
13 Condenser
14 Water tank
15 Fuel tank
16 Boiler flue

Henschel Steam Omnibus Chassis. Illustration reproduced by courtesy of "The Railway Gazette."

condenser fans, passes forward into the condenser which is fixed in front of the bonnet. The water is almost completely recovered: the same water remains in circulation for a long time. The flow of water to the boiler is provided for either by an independent steam pump or by one which is worked by the back axle of the vehicle. The fire blast drives the whole of the air for combustion through the burners up into the combustion chamber whereby it sucks the fuel through a carburetter, the mixture being ignited by a plug. At starting first of all a small motor takes over the working of the blower.

Omnibuses and Lorries. After prolonged experiments carried out on a bus fitted with a private car installation of 80 horse Henschel designed special equipment. For buses and lorries capable of an output of 110 and 150 horse, and the first vehicles to be made are now being tried out.

The boiler has about 9 square metres heating surface and about 230 metres length of tubing. The water is forced by a pump through two preliminary heaters into the boiler below where it is compressed, heated, evaporated; and superheated.

Regulation of Pressure and Temperature. Pressure and temperature are maintained through a succession of control impulses which proceed from the boiler itself, really by a pressure control and a thermostat. The thermostat works through the differential expansion of a steam heated steel pipe and a quartz rod; the pressure control by means of a diaphragm. (The system of boiler regulation was described in our last issue)

The functioning is as follows. At the commencement of an observed piece of work the pressure may have reached the upper limit (100 atmos.) of high pressure. The temperature of the superheated steam is then 450 C. Should the pressure now fall about 5 atmos. through consumption of steam by work done, the pressure control immediately causes a draught of more air. During the fall in pressure the temperature also falls somewhat. But the blast raises the temperature again while at first the pressure declines a little more. As soon as the temperature reaches 450 C. again, however, the feed pump is brought into action by the thermostat. Consequently the pressure rises again to 100 atmos. when through the action of the pressure control both air blast and supply fuel are cut off. If for any reason the temperature rises to 470 C before the pressure has reached the cutting off limit then the blast is disconnected by the thermostat while the feed pump remains still in action. If the temperature does not fall, precaution is taken through the control so that the pump is not kept going; a lower “cutting-in” limit must be given to the pump or else there is a possibility that through lack of fuel and consequent reduction of heat, the boiler may receive too much water. In order to avoid any considerable fluctuation in water level, not only is the regulation temperature of the end of the boiler regulated, but by means of an injection in the central pipe zone, part of the steam and water mixture is drawn away and reconnected to the pipes near the end of the coils. By the correct adjustment of these conditions through extensive experiments very satisfactory pressures and temperatures can be maintained.

In the auxiliary engines and control valves the impulses are given the opening and closing of current controlling contacts in the regulator. When the

firing starts, the plug, fuel pump and air blast, motor receive current while the steam driven feed pump through a magnet valve receives live steam. It should be mentioned that the blast turbine has a bypass valve which conducts exhaust steam round the turbine when the regulator system starts the firing and exhaust steam from the engine is available. This valve also is magnetically controlled.

Speed regulation. The driver is freed from any supervision of the steam producing apparatus through the automatic regulation of the boiler. To alter speed he need only press a foot pedal. The elasticity of the steam engine dispenses with complicated mechanisms, and all gearing is avoided The driver's attention therefore can be given entirely to the road. How great this advantage is can be realised when it has been shown statistically that a motor omnibus operating in and about a great city necessitates daily about 4,000 manipulations of levers and other controls.

Since the maximum steam power can be transmitted at once to the engine, tractive effort is attained with the first movement and there is smooth transition to the highest speed. This quality is responsible for the more rapid acceleration and superior hill climbing power of the steam engine. Experiments carried out in the congested streets of great cities have shown an increase in average speed of approximately 30 per cent. According to the condition in which the vehicles are to be used, whether in flat or hilly country, and the maximum speed desired, the car can be built with the corresponding back axle ratio.

The engine works generally with a starting pressure substantially less than 100 atmos. according to the extent to which the foot-operated main throttle is opened depending upon steepness of incline or travelling speed required. To increase the tractive power in extraordinary cases, besides the throttle control there is possible also an admission regulator of the engine. By means of a foot lever this can be increased to 80 per cent. and can quickly be allowed to fall again the normal 35 per cent. This foot lever also serves for reversing whereby the position of the valve motion is changed. The last forward movement of the car can thereby be arrested by steam pressure and the vehicle accelerated backward. Through the reverse position of the engines valves an additional braking action is effected which can be strengthened when necessary by the use of steam in the opposing direction.

The two cylinder compound omnibus engine of 110 horse power and 1,500 revolutions per minute, is seen in the illustration. An automatic steam chest admission valve at starting gives throttled steam to the low pressure cylinder. The lubrication of the engine's cranks, etc., is effected by means of splash, while the steam cylinders receive oil by means of a pump.

Noteworthy is the arrangement of the engine carried unrestrained on the back axle which has been thoroughly tested and approved. Enclosed dynamo and brake pumps are carried on the back axle. The live and exhaust steam pipes are led to the engine by ball joints without packing boxes, which method of conveying steam has been proved to be free from any objection. And finally to the completely vibration-free working of the steam engine is due the long life and preservation of the structure.

Fuel and consumption. Nearly all liquid combustibles are suitable for fuel, whether home or foreign products, like gas oil, brown coal tar oil (hot), solar oil. And without special installations benzine or alcohol as well as any mixture of these that one cares to use, can be used. The steam car therefore exhibits a high degree of insensibility to variation in the kind of fuel used. Experiments with coal tar oil are about to be undertaken.

The consumption of omnibuses and lorries with reasonable mixtures per 100 km. is somewhat higher than with motor cars. On journeys in hilly country for a 5 ton lorry or an omnibus carrying 40 to 45 people it amounts to 50 litres of oil. The steam car however by the use of cheap oils is able to effect considerable savings. Through these and further by its simplified service, its excellent road qualities, and its anticipated low cost of upkeep, it promises considerable advantage.

Condenser. The condenser has to precipitate about 600 kg. Steam per hour, and requires for the driving of the fans a steam pressure about 0.5 atmos. The warm air escapes from both sides of the bonnet. The advantage of this steam turbine arrangement lies in the automatic adaption of the number of revolutions of the fan to the requisite quantity of cold air.

Weight of car. The weight of the car is kept so low that in spite of its high power this car is no heavier than the ordinary benzine or Diesel motor car with 90 horse power performance.

In the latest Henschel steam omnibuses the engine is at the back end of the vehicle, from which results a saving of length of the chassis and pipe connections, and at the same time an ideal method of carrying away the warm air and fumes from the enclosed engine is obtained. A three axle lorry with trailer for 150 horse power performance is also nearing completion.

Haulage Cars. The great advantages of steam make its use for railway traction of great promise for the future. The Imperial Railway looks favourably upon be new development, and has ordered several steam coaches from Henschel and Borsig. The Lubeck-Buchener Railway has also ordered a steam coach from Henschel. A description follows.

A performance of 300 horse power at the wheel tread was prescribed since the ear was required to travel at high speeds up to a maximum of 110 km. per hour with a trailer. This performance corresponds approximately to that, of a Diesel-electric motor of 410 horse power, for a haulage car. Since the steam units previously built had been restricted to performances round about 100 horse, the jump from 100 to 300 presented a pretty stiff problem. A twin design was finally decided on, specially contrived to work with one engine. Two boilers work at one time on one engine which drives the wheel axles directly under duplicate control of a constant mesh gearing. In future an attempt will be made to design an outfit with one boiler only whereby a further simplification will follow. The construction of the Lubecker ear showed the impossibility of creating a car which can be used both for traction and as an independent car as desired. Steam engines are therefore not amenable to coupling up.

In conformity with the basic idea the design is arranged one-sided to the long axis of the car to provide a convenient passage for passengers which also serves as corridor to the luggage van. The coach has seating accommodation for 70 people and weighs ready to start 48 tons.

(To he continued.)

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The Brooks Steam Omnibus.

STEAM GENERATOR AND BURNER DETAILS.

This steam bus, made by the Brooks Company, of Buffalo, U.S.A., is a fine production, capable of continuous high speed—it will maintain normal working steam pressure at 70 m.p.h. on level roads—so that it will be readily understood there is an ample margin of power to meet the demands likely to be met with in ordinary service.

In this short description we will simply confine ourselves to a description of the Steam Generator and Economizer, and the Combustion System. These contain many novel features, with complete automatic control; and it is interesting to observe that this automatic control is obtained without the necessity of having to use any electrical regulators.

STEAM GENERATOR AND ECONOMISER.

The steam generator is of a modern submerged tube water level type, consisting of special heat resisting vertical steel tubes, which terminate at either end into upper and lower headers. The water level is carried half-way up the top drum, (see diagram figures 1 and 2) the remaining space providing steam storage and for steam separation from the water. The burner—which bolts on to the flange G, figure 2—passes the heat horizontally through the tubes of the steam generator, and thus causes a well-defined rapid circulation of water up the front half of the bank of vertical tubes. This separation of steam from water is effected by sector plates inside the top drum. These are indicated by I in figure 1. The generator has a total heating surface of 200 sq. ft., and it is capable of evaporating about 2,000 pounds of water per hour.

This type of generator has the virtue of generating steam very rapidly, and because the tubes are submerged, the temperature of the tubes is kept within safe limits, regardless of the steaming rate of the generator. The rapid circulation of the water through the tubes, upwardly in the front half and downwardly in the rear half, provides separation of any scale forming materials which are deposited in the lower drum and blown off periodically. In this manner the tubes are, at all times, kept clean and free of scale. The steam and water storage capacity of the upper drum results in absolutely uniform steam temperature and quality.

The products of combustion after passing through the steam generator, pass through the economizer (which bolts on to the left hand side of the boiler-

casing opposite to the burner, in the position marked H in figure 2. The economizer is a small duplicate of the steam generator, except that fins, or gills, are provided on the economizer tubes for efficient heat transfer. Water from the supply tank passes into the economizer, and is directed downwardly through the rear half of the bank of vertical tubes. As the water is heated it rises in the front half of this bank of tubes, and passes to the top drum of the steam generator. The hot water thus coming from the economizer is directly downward through the rear half of the steam generator tubes. This combination of steam generator is very efficient in its extraction of heat from the combustion system, resulting in a very low flue temperature and a very high overall combustion and steam generator efficiency.

COMBUSTION SYSTEM.

The combustion system consists of a revolutionary atomized-vaporized type of burner, in conjunction with a new and fool-proof pilot. This combustion system is the result of considerable research, providing a pilot which is free from all the troubles of the pilots of the past. The main burner consists of an atomizer nozzle fed by fuel under pressure from the fuel pump, which atomises the fuel through a specially designed porcupine tube, (see B figure 3) which vaporize the atomized fuel in suspension. This fuel mixed thoroughly with air under slight pressure from blower fans, enters at FF figure 3, and makes a homogeneous combustible air and vapour mixture, which passes through specially designed grates, AA figure 3, and burns in a smokeless, odorless, silent blue flame. By this ingenious arrangement, the Brooks Company claim, it is possible for the first time to get a high efficiency and cleanliness of a blue-flame fire without any of the objectionable carbon-forming troubles of blue flame fires of the past.

THE AUXILIARY ENGINE.

This unit dispenses with the complicated electrical control systems used in the past on steam cars. It is a 2 cylinder V type double acting engine of variable speed, which has integrally built into it a 3 ram water pump, 3 ram variable stroke fuel pump, an air compressor for the brakes, and an electric generator and starting motor. This auxiliary engine unit also drives the combustion blower fans by means of silent belts. The use of this unit makes possible by the expedient of varying its speed in accordance with steam pressure, the fire intensity, and water and fuel delivery, to accurately and reliably control the air, fuel and water, the burner and steam generator. This vehicle speed engine also has mounted on it a large condenser fan, which provides for condensation in proportion to the demand.

The Brooks bus provides an interesting example showing how a modern quite automatic steam generating system has been evolved, in a very successful manner.

The Song of the Steam Car.

I had a little steam car rather bigger than my thumb,
I might give it fullest, throttle, but I couldn't make it drum
It hadn't got a gear box not yet a friction clutch,
Although these little troubles didn't worry me very much.

I loved my little steam car, I loved it very dearly,
I knew that steam would come again, could see that very clearly.
There are still many good steam men who think just the same
Who owned a faithful steam car, before petrol came.

There are many who still think that petrol fills the bill,
But when one reads their arguments, it makes one feel a trifle ill,
Steam's the better power, they willingly admit, if they only had the will
To put the brains and money down to make it better still.

Before I close and you all are gone
I'll quote the words of Owen John,
His words were these and very sage
They are the last two lines upon this page,
"What do they of motoring know
Who only petrol know?"

SUPERHEAT.

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Correspondence.

The Editor is, not responsible for opinions expressed by Correspondents.

Sir,

I have wanted to purchase a car for some time past, but I cannot bring myself to buy a petrol car, the fumes of which make me ill every time I walk alongside a main road.

If steam aviation is an actual fact, surely it should now be possible to manufacture a steam car to compete with petrol.

I followed the articles and correspondence in the "Model Engineer" about steam cars a year or two ago, and was very sorry that, after going strong far a time, the subject seems to have been dropped. I hope news of this steam 'plane may have the effect of reviving the interest of many others like myself.

R. C. SHILLING.

Strood, Rochester.

* * * * *

Sir,

I am greatly interested in the possibilities of the flash or semi-flash steam generator. It is a type that I associate your firm very closely with. Although I

have been connected with Steam, both afloat and ashore, all my life, I have never seen a flash boiler yet. Therefore, I am hopeful of seeing some convincing illustrations and accounts of same. Wishing you every success.

C. MATTHEWS.

Brigg, Lincs.

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Sir,

There is one suggestion I would like to make for "S.C.D." and that is, that steam as applied to small launches, etc, be included. One has only to live in far away colonies as I do, to appreciate the value of such power as steam. Just imagine being away up North in a large "freight" canoe and getting stranded because the petrol tank has run dry, and the nearest place of supply up a river a hundred miles, long—and nearly all rapids at that—and when you get there, pay as much as £2 10s. per gallon, and only in limited quantities.

Compare this with steam, out here there is always fuel to be got, around the river banks, which can he sawn up with a circular saw on board; that is when the paraffin tank has got empty.

Out here one generally takes a companion, an Indian or a white man, on these long trips, go the stoking is nothing. I am referring now to past events, having done some of this machinery erecting stuff for Fairbanks, Morse & Co.

O. PET'TERSSON.

Winnipeg.

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Sir,

I was most interested to receive "S.C.D.", as I still think there no power like steam, and dream that the world is going back to it—slowly but surely. But for suppression (in various dark forms) I feel that the new age of steam would already have arrived. And it is certain that if the brains expended in refining the I.C. engine had been put to improving the steam engine, we should not be in the transport mess with excessive freights, etc., that we are in now. Nor should we be deafened choked and poisoned off the earth like we are today.

That was a fine article on steam aviation. I send my best wishes to the success of your venture, and shall certainly become a subscriber to your journal.

H. PRIEST.

Harleston.

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Sir,

The first edition of "S.C.D." in its new form was very interesting to me. I am glad to know that Mr. Kitchen, of Windermere, is a subscriber, and I doubt whether your present day readers are acquainted with the very active part he took in the development of the Steam Commercial Vehicle years ago.

I remember seeing the bus he refers to in his letter. I believe it the Agricultural Hall, Islington, London, and if I remember rightly, it was called the "Critchley-Norris." I considered it the smartest thing in the Show, and if it were still in being would go miles to have another look at it. As Mr. Kitchen says, it was well before its time, but to my mind was one of the most practical things I ever saw. Its appearance was good and the whole layout very straightforward and practical. It was fitted with Mr. Kitchen's "Lune Valley" Water Tube Boiler and Burner. I always considered the Burner a good job and very trouble-free.

I could never understand why this bus was never developed further, particularly in view of the tremendous amount of interest it created at the Show. Do please try to publish the photographs offered by Mr. Kitchen, and perhaps he will give us some further information about its performance on the road.

W. J. SCOTT.

Sentinel Depot, Liverpool.

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Sir,

I must congratulate you on this new production, and I sincerely hope the venture will prove successful. The articles in the June issue I found most interesting, and on the steam aeroplane I think we can deliver the goods.

J. GORE.

Minster.

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Sir,

Although not an owner of a steam car I am very much interested in them, and as there are practically none in use in this city, it is difficult to get any information concerning them here. I trust your new paper will contain descriptions, if possible with drawings, of the various types of boilers and engines in use on steam cars today which will enable interested in the subject to become familiar with this type of automobile even though they are not steam car owners.

Wishing your new publication every success.

A. F. ADAMS.

Montreal, Canada.

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Sir,

Might l suggest that you republish Mr. Doble's notes on the steam car subject? I still have some of your other papers left, but they are getting the worse for wear. Although I am a Motor Lorry fitter of the South African Railways, I always maintain there is nothing like steam, and our foreman has the same views. We have seen what both can do. I am at present, in my spare time, making a small steam plant, the engine being a 90 degrees double-acting,

with one overhung crank, two sets of Stephenson's motion—which are on ball-races, as is all the engine, with the exception of the big-end, which is a plain bush. The size of the cylinders, which have slide valves, is 1½ inches by 1¼ inches bore and stroke. An oil pump is fitted to the front end of the crankcase; and the whole engine is enclosed.

The car in which I am fitting this rig quite a midget affair, Single-seater. Track 2ft. 8in., wheel-base 4ft. 8in. Length overall about 6 ft. 6 ins. The final drive will be by chain, not because I prefer this drive, but owing to ease in changing sprockets in experimenting for gear ratios; the whole car being in the nature of an experiment. I hope in a few weeks to send a few snaps of the engine and parts as far as it has progressed.

V. R. BUCKENHAM.

Bloemfontein, O.F.S.

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Sir,

It was sheer joy to receive the first of the new series "S.C.D. & S.A.' and I congratulate you on your pertinacity and grit in putting up another round in the fight for steam.

I shall be waiting with eager delight the appearance of the next and subsequent numbers. To a man jaded with the kaleidoscopic changes of the last 30 years, it will add a new zest to life. If the hopes and fancies of the flying pioneers (steam) should materialise, it will be dramatic come-back to steam; and cannot fail to influence progress in cars as well. So we may yet rejoice in seeing the steamer actually swarming on our roads.

Does it not remind you of the fight between gas and electricity? The re-appearance of steam motor cycles is interesting, as also the rejuvenated Stanley, and shall we hear more of Mr. Cowper-Essex's efforts? I see that Mr. Doble is in this country, and hope he will give us some more of his interesting letters.

D. A. DAVIES.

Newport, Pembroke.

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Sir,

May I have space in your correspondence columns for the following remarks? Firstly, as regards the important question of insurance raised by Mr. Rendall. I have just had an interview with the Manager of the Accident, Department of the provincial Insurance Co., Ltd. This is a non-tariff Company, and their rates are considerably lower than the tariff companies, but it is hardly necessary to add that it is absolutely a first class Company. They are agreeable to issuing third party polices at their standard rates, to owners of steam vehicles.

The following questions extra to those usually found on a proposal form will have to be answered: (1) Type of Boiler, Water-Tube, Fire-tube, or Flash. (2) Age and condition of boiler. In the case of Fire Tube boilers the Company will require a certificate, signed by a competent steam engineer or boiler inspector, stating that the boiler is satisfactory under a water pressure test for 20

minutes of two and one half times the working pressure. The Company, of course, does not bind itself to accept any particular proposal. As regards comprehensive insurance, I was given to understand that any application would be judged on its merits.

I suggest that those who are desirous of insuring steam cars or cycles should communicate with the Company's agent here, which will save much trouble: Mr. Edward Tyson, Rank Chambers, Ambleside, Westmorland.

The Liverpool Castings & Tool Supply Co., has a finished 3 cylinder Ricardo engine in their window about 18 months since.

I entirely agree with Mr. Rendall that the only way the majority of your readers will be able to have steamers, is by communal effort. Let us try and form a list of those who have the necessary facilities and are willing to give a hand. It is rather a pity to have to employ a single-acting engine, but, that seems the easiest to make.

How about an Austin 7 engine, using 3 cylinders only and a special crankshaft? If about 40 readers were prepared to take them, it, is just possible I might be able to persuade a certain drop-forging Company to produce the forgings at a more or less reasonable figure. The water-jacketting could be knocked off, and a pattern for a steam cylinder head presents little difficulty.

Fawcett-Fowler type pistons are easy, and a new camshaft "lumps each side," or a normal one re-geared 1 to 1 would do the trick. I would suggest a modest cut-off, and no reverse—the gearbox would suffice for this. The car would, perforce, have to be a 2 seater with boiler or generator in the rear. Not a bad place for a boiler anyway. A proper tubular condenser is essential, in my opinion; but gilled tubes are easily obtainable.

The top gear ratio of the Austin 7 is, of course, rather low for steam, but with sensible valve sizes this would be no deterrent, as the engine is balanced for high revolutions. Oversize tyres would help. I believe Mr. Houghton of Eccles, who is an expert patternmaker, and an ex-Morris owner, would do anything reasonable in that line at a modest profit.

I have patterns for my direct-acting steam pump, steam cylinder 1½ inches bore by 3 inches stroke, 2 water rams 5/8 inch diameter. This is machinable on a small lathe, and I will send you a drawing and a short description of the rest of my experimental steam car, at an early date.

Congratulations on the paper, which has started well. Keep it up, and let up have good illustrations and drawings.

C. S. COWPER-ESSEX.

Ambleside.

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Sir,

I am particularly gratified at finding your journal and hope to be a regular subscriber to such an essential teacher, though I beg leave to break the calm acceptance of the reciprocating engine.

My ambition in life is to develop the Rotary Pressure Engine in preference to that of the reciprocating type. Any half successful Rotary Pressure Engine will be more economical than the best possible reciprocating engine.

I am enclosing a print (this will be reproduced in the August issue–Ed.) for the interest of yourself and readers, who may, like myself have great faith in Steam Plant for aircraft.

The Petrol Engine is a nice piece of work, but I am not in favour of engines that are designed to choke themselves, and otherwise knock themselves to pieces at high speeds of a few hours duration. My latest contribution to this service "Improvements in Steam Plant for Aircraft" Patent No. 17572/34 is, I believe, the only solution to economic flying in groundsphere or stratosphere; it is of the turbine principle.

McKINLAY HARGREAVES,

Caversham.

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Sir,

Thank you for the first issue of "S.C.D.& S.A." It is an interesting little publication and I sincerely hope it may thrive.

After reading it through, I wonder if it would not be feasible to make some arrangement to get out an experimental steam car, that would meet the competition of the petrol car of today. Many of us have done experimental work in the intervening years, and I for one have at least a little wisdom in the process, inasmuch as I now can at least claim to know pretty well what can not be done, or should be avoided.

Then again most, if not all, steam car enthusiasts and experimenters cannot-dispose of the funds they could draw upon in the past,. It seems necessary then to devise some plan that entails the least possible cash expenditure and for the present purpose of having your preliminary views on my plan, here is the very rough sketch of my proposition.

That a number of men, selected as much as possible to represent the various professions and trades necessary to produce a car (designers pattern-makers, moulders, machinists, boilermakers, etc.,) and imbued with as much as possible co-operative spirit, get together and enter into some form of agreement for a specified period of time (two or three years).

All members of this body would undertake to work on the car in their own particular sphere or capacity, free of charge in what spare time they feel they can reasonably devote to the purpose.

One individual, with the necessary qualifications, would take charge of co-ordinating the several "departments" and act generally as manager.

He would be called upon to provide a place where the chassis could be erected and which would serve as the official address of the organization, club, society, or whatever you wish to call it.

Next each member would be expected to donate any and all material, experimental chassis, units, etc., already in existence from previous individual attempts, and which might appear to be of any use to the concerted attempt.

If you have followed me so far, and things have not appeared visionary, we will take the next step and consider the financial aspect. All labour, as pointed out, being free, we are faced with the cost of such new material as we shall certainly require, in spite of the contributions already mentioned. For this purpose not only the several "members," also further inactive parties would be asked to make contributions to the cause. All such contributions would be duly accounted for and booked to the respective donor's names.

The object, of course, is as follows: Should the work prove successful ultimately and attain marketable value, each individual would be entitled to a proportionate share in the profits—whatever form that might take according to cash contributions made during development. It might be object that one individual may have put in much work and little money, and therefore feel in the end that he had got worsted; that is admittedly a difficulty, but I don't consider that it would be feasible to satisfactorily gauge the cash value of "time" contributions—if the main idea is to get on with the job.

Besides, any man entering into this scheme would have to be sufficiently imbued with the sporting instinct. He would have the pleasure of co-operating, and finally the conditions would be such as to induce each one to take the largest possible financial interest in the gamble; more particularly in the final stages, when from personal experience, I know money will be most wanted.

In the event that you consider that there might be anything in this idea, and that it is worth going further into, I would suggest that you discuss it with your friends. Perhaps it would be helpful to forward copies of the scheme to likely people, but, of course, it would be necessary to leave out men who are at present active with firms working on steam car development, and, restrict the approach to "free-lances" like myself and others.

T. L. REEPMAKER D'ORVILLE.

Esher.

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Sir,

May I congratulate you on No. 28 good as the paper was before, I think it will be generally agreed this issue is by far the best up to date.

With regard to the claim you make on behalf of the Besler plant without wishing to distract in the very least from a splendid achievement, which must command the unstinted admiration of all lovers of mechanical science and steam enthusiasts, I think, in justice to that wizard of the past; the late Sir Hiram Maxim, that the scope of the claim should be narrowed. To that great Engineer and inventor unquestionably belongs the honour of being the first man to rise into the air on a machine heavier than air propelled by mechanical power, steam being the power he adopted. True the machine was devoid of means of directional control either vertical or horizontal, also of stability and balance. True an accident was responsible for "free" flight being obtained, but, to my mind at least those facts do not detract from one of the most wonderful

achievements in the history of engineering. The flight to the best of my recollection antedated the first experiments of Wilbur and Orville Wright by some 25 or 30 years and must be recognised as the true commencement of mechanical flight.

The engine used by Sir Hiram Maxim is still preserved at South Kensington—I saw it myself in 1913 or 1914, so far as I could judge in perfect working order. Sir Hiram has, apart from this wonderful effort, other claims on the gratitude of everyone interested in Aviation as he was I believe the first to investigate seriously the properties of "planes" of various sections in an air stream, and to this end designed and constructed the first "wind tunnel." All this and much more he published in a book entitled to the best of my recollection "Mechanical Flight."

By all means let us take off our hats to the brothers Besler and to Mr. Abner Doble and their assistants for being the first to achieve controlled mechanical flight with a steam driven plane; but in doing so let us not forget the grand old man for whom it may justly be claimed was the father of mechanical flight.

I should like to second the request of Mr. Illingworth for a description of the Pearson Cox Car and to suggest that some details of the Turner Miesse, Locomobile, and others, preferably with comments on their good or bad points would be acceptable.

K. A. HELLON.

Herts.

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Sir,

Many thanks for the Steam Car Journal received this week. While I was always pleased to receive each of those previously issued, I think that you have now greatly improved the publication both in size and style.

It is to be hoped that you will be able to continue to provide reading equal in variety and interest to that in the current issue.

The general impression received from a study of the correspondence section seems to augur well for this renewed enterprise on behalf of a valuable and fascinating cause.

J. B. ASHDOWN.

Godalming, Surrey.

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Sir,

Thanks very much for yours of recent date re steam matters. I shall be very pleased indeed to receive the new publication regularly, and hope the paper will receive its deserved support. It is high time the public had some interesting information on modern steam motor practice other than the much overdrawn petrol and oil outfit, which, by the way, is getting rather boring to some of us.

A. W. FIELD

Clacton on Sea.