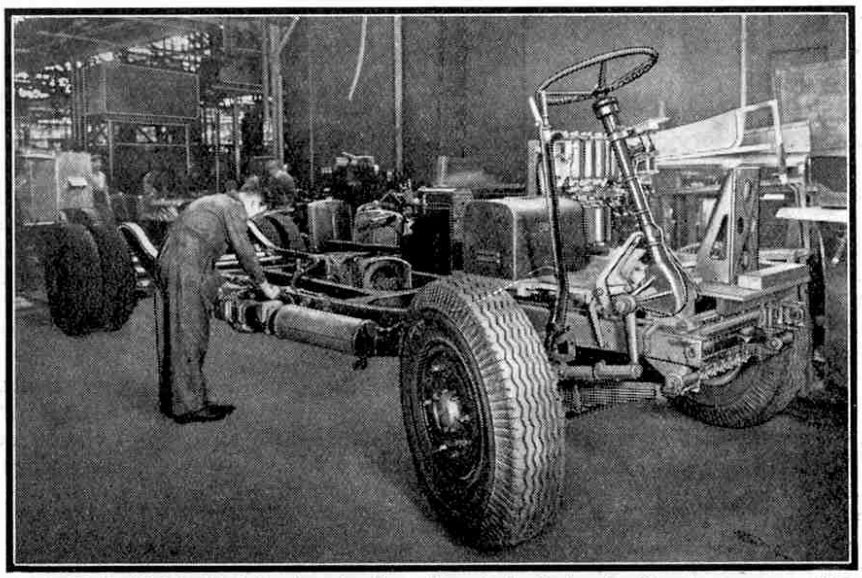
Transport are now the world's largest operators of trolley buses.

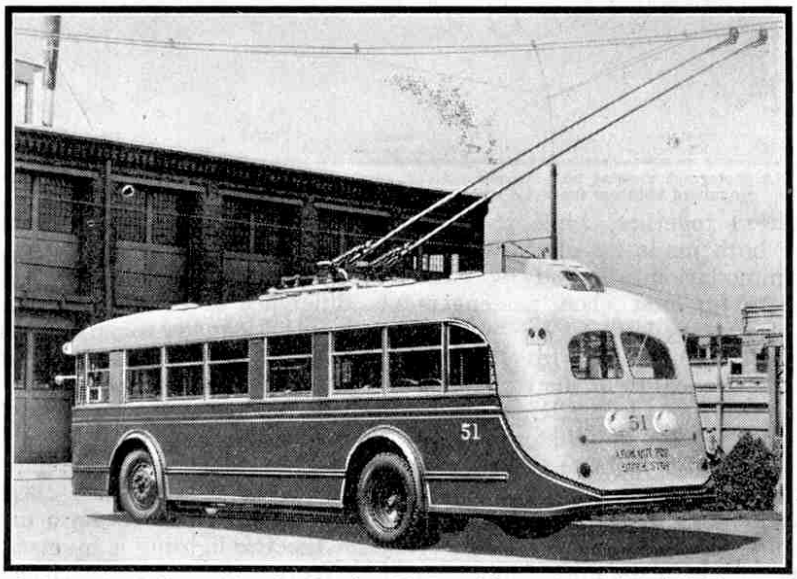
Trolley buses were introduced in London because the tramcar tracks were becoming worn out. This made expensive renewals necessary, unless an alternative system of transport could be provided, and for this trolley buses were considered to be suitable, largely for two reasons. One was that their carrying capacity was practically equal to that of the tramcar. The second reason was that there was already in existence a plentiful supply of electric current, and the only change necessary was to substitute two wires for the one already in existence on the tramcar routes.



An A.E.C.-English Electric trolley bus chassis receiving final adjustments. The air compressor of the braking system can be seen on the outside of the frame.

The changeover from tramcars to trolley buses on any chosen route is of great interest. The trolley buses invariably make their first appearance on a Sunday, when there is less traffic on the roads and more time is available for the work that has to be done. Tower wagons work all night erecting the dual wire system in its new position close to the side of the road. Further changes may be necessary, for the greater weight of two overhead wires may require the provision of stronger steel poles; tower wagons then remove the existing poles and plant stouter ones in their places. As the changeover proceeds, particularly on the routes that terminate in the city, provision has to be made for turning the buses round with a continuous forward movement, for in the city no vehicle is allowed to reverse. This may necessitate a turn round a block of buildings; in others a large turning circle is arranged. In any case the overhead construction to support the trolley wires will have to be altered.

It has been found that tramcar drivers when trained are perfectly suitable for work on trolley buses. Trials are given to all who are displaced when a changeover is made, and well under five per cent. fail to make good. They first learn the controls in the depots, where they drive slowly on private ground, and are then taken out in groups of three on a bus with an instructor for eight hours. Each drives for half an hour in turn and in the intervals watches his colleagues; thus they are not subject to undue strain while becoming accustomed to their new vehicles.



A 40-passenger trolley coach at San Francisco. Photograph by courtesy of the British Thomson-Houston Co. Ltd., Rugby.

Trolley buses can now pick up current through a sliding collector shoe instead of a trolley wheel. The shoe runs more smoothly and is less noisy in action. It consists of a V-shaped skid with an angular opening of about 65 deg., and contact with the trolley wire is made through carbon inserts on each side of the "V." These inserts have a working life of between 1,000 and 2,000 miles and can be replaced quickly and inexpensively. With this type of collector it is necessary to lubricate the overhead wire with a graphite mixture, and a petrol bus driven along the route supplies lubricant under pressure in the requisite small quantities through special booms and shoes. In due course the wires become burnished and require less frequent lubrication.

The A.E.C.-English Electric trolley buses are interesting examples of these vehicles. They include single and double deckers with seating accommodation up to 74. The modern 74-seater has two rear axles. The motor is mounted under the low floor, and a short propeller shaft transmits the drive to the axles through needle roller couplings. There are three differentials, the third being mounted in the worm casing of the middle axle, and this gives even distribution of driving power over all four rear wheels and avoids uneven wear on the tyres, when going round curves.

All six wheels are fitted with internal expanding brakes operated by compressed air, and in addition a hand lever operates the brake shoes in the drums of the four rear wheels independently of the compressed air system. The total area of braking surface is 825 sq. in. A foot lever controls the compressed air braking, pressure on it admitting air as required to small cylinders mounted near the ends of the axles, from which it operates the shoes. Air at a pressure of 85 lb. per sq. in. is obtained from a reservoir tank carried on the side of a chassis, and this pressure is maintained by means of a compressor driven by a 500 volt motor.

An interesting feature of the system is an anti-freezer. This feeds alcohol from a small reservoir through a wick into the air stream inhaled by the compressor. The alcohol condenses with any moisture in the air, and the mixture has a lower freezing point than water alone and thus prevents solidification.

A trolley bus is insulated from the ground by its tyres and for this reason effective insulation, capable of withstanding exposure and road splashing, is necessary for every part of its equipment. All electrical units are mounted on secondary insulators, and even if one of them became alive there would be no leakage to the body or chassis of the bus. A special multiple testing plug is fitted to enable the electrical insulation resistance of these units to be measured by means of the depot testing apparatus. Triple insulation is provided on all electrical resistances and between the trolley heads and the bus body. After erection the entire equipment is subjected to a test for one minute under a voltage of 2,500 volts.

The motor of the 74-seater trolley bus is of 80 h.p. and is governed by means of a master controller placed under the driver's seat and operated by means of a foot pedal. A hand-operated reverser is mechanically interlocked with the controller, which automatically returns to the "off" position when the pressure of the driver's foot is released. Regenerative braking, in which the vehicle is controlled by current produced by the motor, is employed. Plain regenerative equipment would not be effective at speeds of less than 10 to 12 m.p.h., however, for the motor then cannot generate current at a voltage equal to that of the overhead line supply. A special patented system incorporating rheostatic braking that operates at all speeds therefore is used.

During the last 14 years trolley buses have been finding favour in American cities. At present some 1,500 of them are in operation in the United States, and these are mostly of single deck construction carrying 30 to 40 passengers. The lower illustration on this page shows a 40-seater trolley coach, with electrical equipment made by the General Electric Co. of New York, in service in San Francisco. It has 65 h.p. electric motors.