30 H.P. Motor.

THE ENGLISH ELECTRIC COMPANY LIMITED.

INLAND TELEGRAMS:
"ENELECTICO, WESTCENT, LONDON."

CABLES:
"ENELECTICO, LONDON."

DIRECTORS:
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PRIVATE BRANCH EXCHANGE.

Head Office: QUEEN'S HOUSE, KINGSWAY, LONDON, W.C. 2.

SPECIFICATION

FOR

VENTILATED TRACTION MOTOR DK. 34.

(Box Frame for 24" or 27" Car Wheels.)

VENTILATED TRACTION MOTOR TYPE DK. 34 is specially designed for a small car wheel of diameter between 24" and 27".

TRACK GAUGE.

The DK. 34 motors may be used on a track gauge of 1·22 metres (4 ft. 0 ins.) and upwards. On the minimum track gauge of 4 ft. 0 ins. the car wheels would have to be arranged to suit the motors.

MAGNET FRAME.

The magnet frame is of high permeability cast steel and is made in the box frame type only.

Bored and recessed openings are provided at each end to receive the armature bearing boxes, which are secured by steel bolts tapped into the frame and securely locked against turning.

Suitable machined seatings are provided for the four main and four interpoles, and also for the brush holder yoke. A large opening with pressed steel cover is provided over the commutator and brushgear for easy inspection and adjustment. The cover is held in position by means of a spring lock and is easily removable; a hand hole with a cover is also provided directly underneath the commutator.

Suitable openings fitted with perforated metal or gauze covers are provided for ventilation, the inlets being behind the opening over the commutator while the exhaust openings are at the pinion end of the frame.

Carefully machined and registered joints are provided at an angle of about 60° to receive the axle bearing boxes.

ARMATURE BEARINGS.

The armature bearings consist of solid bushes made of special anti-friction bronze with grooves machined to distribute the oil over the surface of the journal. The thickness of the bushes is sufficient to allow for re-lining with white metal when renewal becomes necessary. The bushes are securely keyed in position in the cast steel bearing boxes.

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The lubrication is by means of wool waste and horsehair saturated in oil in direct contact with the shaft for practically one-third of its diameter on the low-pressure side. The oil reservoir is of sufficient capacity for two or three weeks' running. To prevent the oil creeping along the shaft into the motor, suitable oil throwers are provided.

ARMATURE CORE AND SHAFT.

The armature core is built up of thin steel laminations of a low hysteresis loss, each sheet being thinly coated with insulating lacquer. Slots are stamped in the laminations before assembly, to receive the armature coils. Large axial ventilating ducts are left to allow a free passage of air through the core.

The core is carried on and keyed to the shaft and is held in position by a cast steel end plate and steel nut securely locked. As no radial ducts are required, spacing supports are eliminated and laminations can be clamped together under very great pressure, thus ensuring a tight core.

The back end plate which is pressed and keyed on the shaft, supports the armature winding at the pinion end and forms a powerful exhaust fan.

The shaft is made of best quality forged steel, ground to gauge. The journal surfaces are rolled to ensure the maximum life of the bearing bushes.

ARMATURE COILS.

These are machine wound, the wire being double-cotton and asbestos covered.

The coils are twice dipped in special varnish and baked between dippings; the parts of the coils which go in the slots are insulated with mica, parchment paper and cambric tape, then vacuum dried and baked for twelve hours under vacuum. The coils are then placed in the slots, which are lined with leatheroid to prevent mechanical injury, the core being first sprayed with air-drying black varnish. Binding wires of steel, sunk flush with the core and insulated from the coils with hard wood strips, hold the windings in place.

The end windings are supported by the back end plate and clamping plate, thereby completely shrouding the windings on the under-side. After the binding wires are in place the whole armature is baked for twelve hours and given a final spraying of air-drying black finishing varnish.

COMMUTATOR.

The commutator is built on a separate cast steel spider keyed to the shaft and held in position by a steel nut shrunk on the shaft.

The bars of hard drawn copper, finished accurately to gauge, are insulated from each other with best grade mica, and held in position by heavy end flanges, fitting into deep "V" notches turned in the bars. The end flanges are insulated from the bars by micanite end-rings and clamped together by a steel nut at the front end, enabling a bar to be taken out without dismantling the commutator. The mica between bars is cut away to a depth of 1·2 mm. (3/64 inch) below the surface of the commutator and this depth of groove should be maintained as the commutator wears down. An allowance of 12·7 mm. (1/2 inch) is made for radial wear.

POLES.

The main poles are built up of thin steel sheets riveted together between cast steel end plates and shaped to form a shoe to give the proper field distribution, and at the same time serve as a support for the field coils.

The interpoles are made of drop forged steel with shaped pole tips for supporting the coils. Both main and interpoles are accurately machined and clamped to turned seatings on the magnet frame by steel bolts.

FIELD COILS.

The main coils as well as the interpole coils are made from copper wire of square section, double-cotton and asbestos covered; they are machine wound upon formers, being subsequently impregnated in a vacuum with insulating compound in order to fill all the interstices. They are then baked, and afterwards insulated with a combined covering of mica and paper taped over with strong braided webbing. The complete coil is finally treated with a special compound and again baked to render it impervious to moisture.

Each coil is clamped between a pressed steel spring bearing against the machined seating on the magnet frame and a brass washer supported by the pole shoe. Any shrinkage of the coil is thus taken up automatically and a rigid construction assured, failures from loose coils being entirely obviated.

BRUSH HOLDERS AND BRUSHES.

The brush-holders are made of cast bronze, they are adjustable radially and are clamped to an insulated yoke by securely locked steel bolts, which are accessible by removing the commutator cover.

The brushes are of carbon provided with flexible copper connections, and slide in accurately finished boxes; each brush is independently adjustable.

AXLE BEARINGS.

The axle bearing bushes are split and made of anti-friction bronze with machined grooves for distributing the oil. They can be re-lined in a similar way to the armature bearing bushes.

They are keyed in cast steel boxes which are bolted to machined registered surfaces on the magnet frame; the method of lubrication is the same as for the armature bearings.

They are designed for a maximum axle diameter of 102 mm. (4 inches).

AXLE DUST COVER.

A dust cover is fitted round the axle between the motor axle bearings.

SUSPENSION.

Two lugs are cast on the upper half of the magnet frame on one side for attachment to the cross suspension bar; the motor frame is supported on the opposite side by the axle bearings.

GEARING.

The power is transmitted to the axle through single reduction spur gearing. The pinion is of special high-grade steel cut from the solid, keyed to a taper on the armature shaft and held in position by a steel nut securely locked. The gear wheel is of special high-grade steel and is made of the solid type only, due to the limited size.

The teeth are accurately cut to No. 4 diametrical pitch with a face width of 115 mm. ($4\frac{1}{2}$ inches). The standard gear ratio is 15 teeth in pinion and 67 teeth in gear wheel, although where required a different ratio may, within certain limits, be provided.

GEAR CASE.

The gearing is enclosed in a pressed steel case which is in halves, clamped together with steel bolts securely locked; each half is pressed from a solid sheet 4·7 mm. ($\frac{3}{16}$ inch) thick. The case is supported at each end directly under the flanged lugs, and no riveted brackets are therefore required. The cast steel arms forming the supports are designed to withstand heavy vibration and the case is clamped to them by steel bolts.

RATING.

On a shop test at the rated voltage, at the end of a one-hour's continuous run with full load through gearing, the temperature rise will not exceed 75°C. (135°F.), measured by thermometer, above a surrounding air temperature not exceeding 25°C. (77°F.). In this connection it is important to note that due to the positive ventilation the continuous capacity on a shop test with the same temperature rise is about 70 per cent. of the one hour rated capacity, 40 per cent. being a comparable figure for the unventilated type of motor. The above ratings for the ventilated motor are with perforated covers over all the ventilating openings.

The motors will run in either direction from no load to 100 per cent. overload current, with fixed brush positions, practically without sparking.

INSULATION TEST.

The insulation between field coils and magnet frame and between armature windings and armature core is tested at 2,500 volts alternating current for one minute.

INTERCHANGEABILITY.

All parts of the motor are machined and finished to gauge and all drilling is done in special jigs, ensuring absolute interchangeability of all similar parts.

VENTILATION.

A special feature of this type of motor is the system of positive ventilation. Large axial ventilating ducts are provided in the armature core extending through the commutator hub at one end and leading to a powerful exhaust fan at the pinion end of the armature. The fan itself forms part of the end plate. The air enters through screened inlets at the commutator end ; one current of air is drawn through ducts in the armature core and another current passes over the armature and round the field coils, both paths meeting at the fan, which discharges through four screened outlets at the pinion end.

The volume of air and its velocity are such that any dust entering the casing is carried right through and expelled, this operation being facilitated by the smooth and direct air passages and by the unidirectional character of the air currents in the casing.

If, for special reasons, such as the fear of water entering the motor, it is considered desirable to close the bottom ventilating openings by solid metal plates instead of perforated covers, the continuous output of the motor on a shop test for the temperature rise specified above under " Rating " will be reduced to approximately 65% of the one-hour rating. In the event of *all* the ventilating openings being closed by solid covers, the continuous output under similar conditions will be still further reduced to about 50% of the one-hour rating. It is not usually found necessary to fit solid covers to the lower ventilating openings but it has been done in a few cases ; the necessity for fitting solid covers to all the ventilating openings never arises unless some very severe and peculiar conditions of service have to be met.

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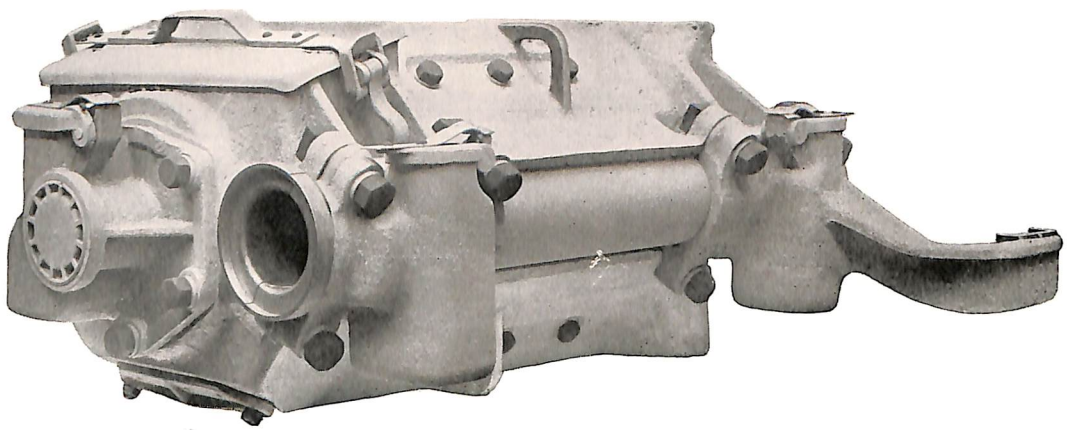
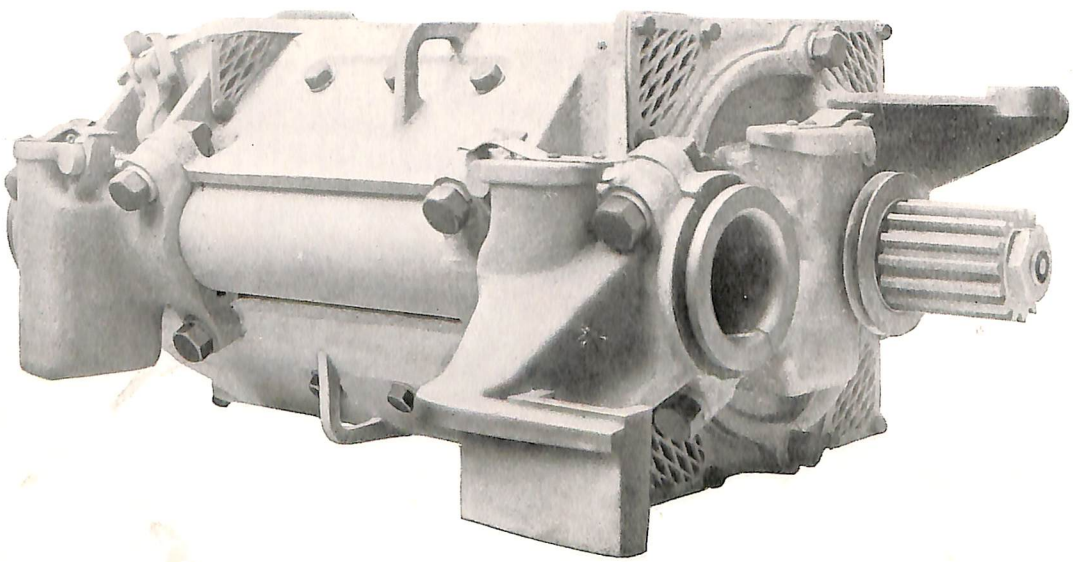
DK. 34 VENTILATED TRACTION MOTOR, BOX TYPE.

FOR 24 in. OR 26 in. DIAMETER CAR WHEELS.





April, 1921.

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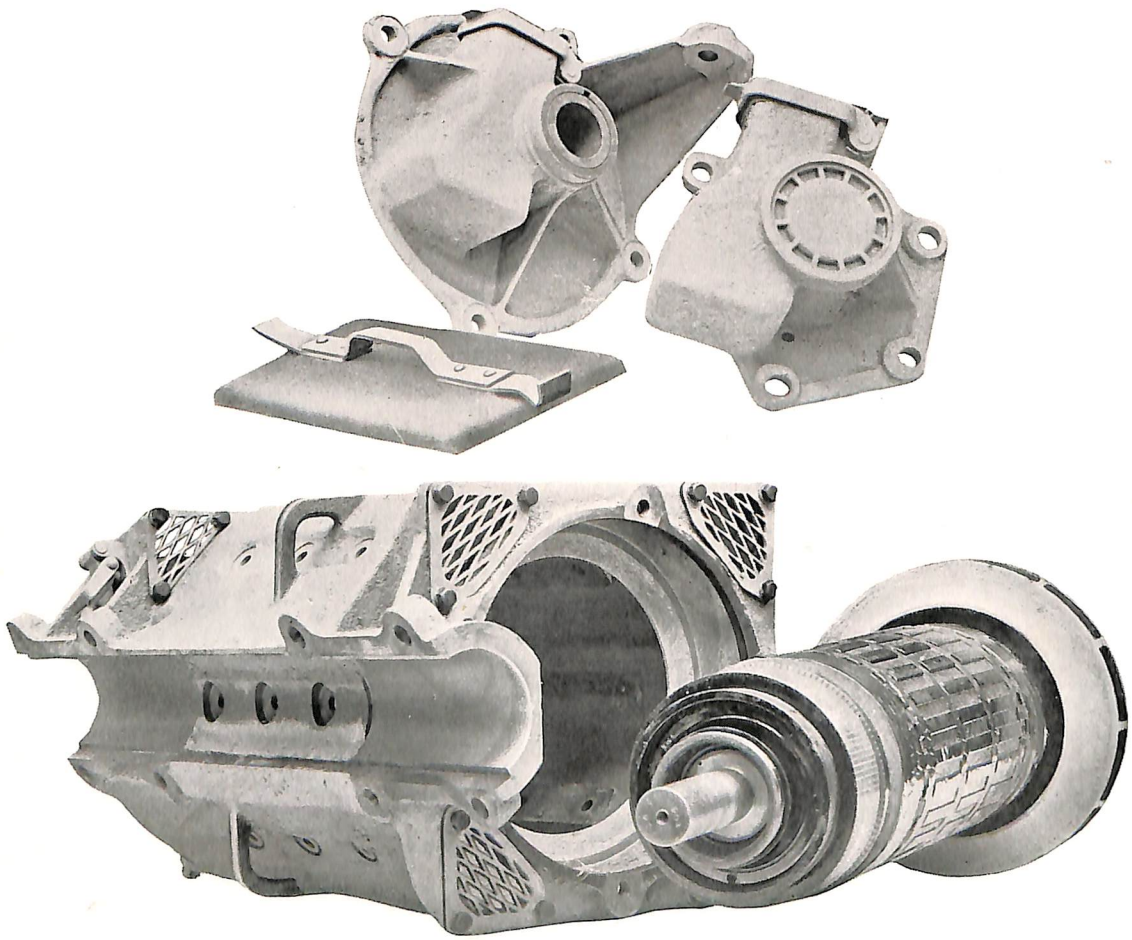

MOTOR SHOWN OPENED UP.

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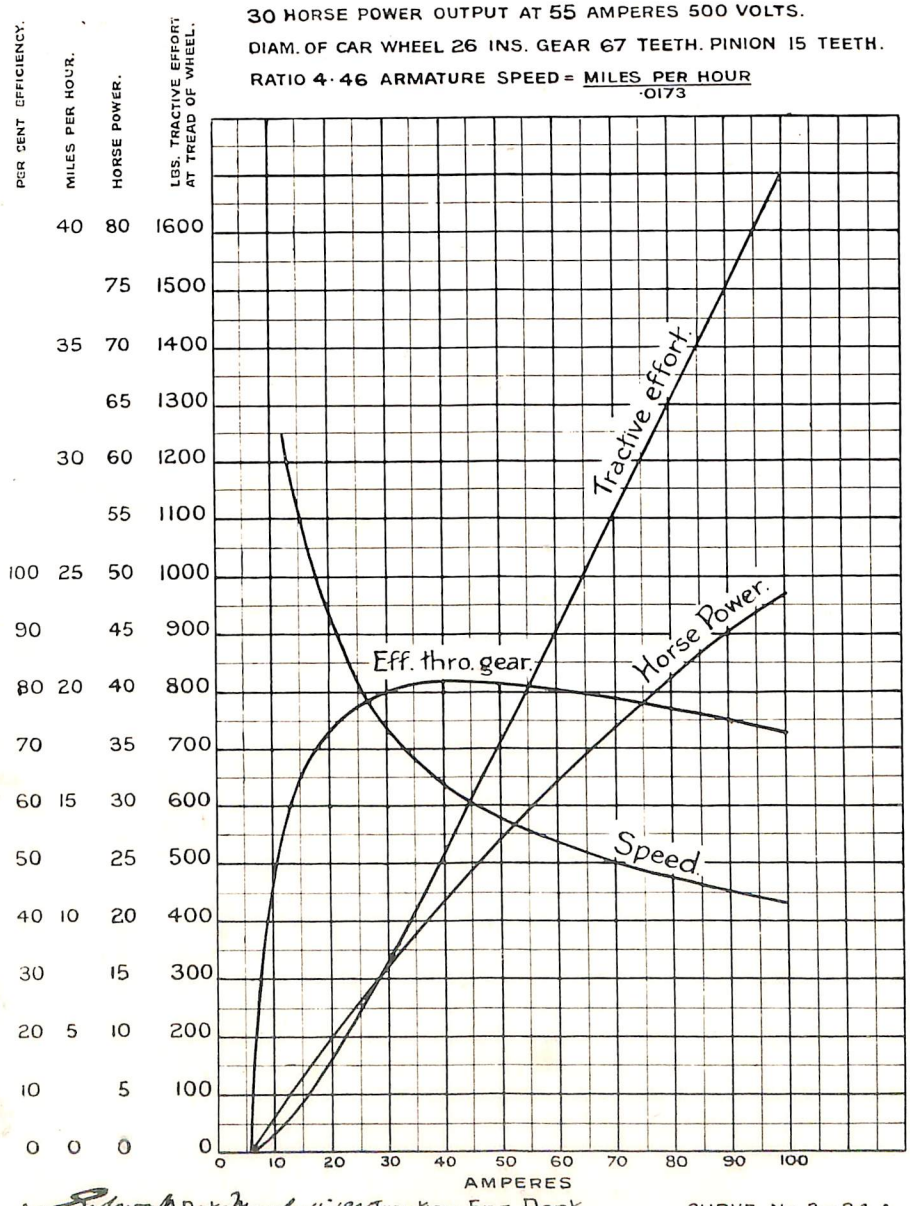
TRACTION MOTOR D.K.34A.

PERFORMANCE CURVES (English Units).

30 HORSE POWER OUTPUT AT 55 AMPERES 500 VOLTS.
DIAM. OF CAR WHEEL 26 INS. GEAR 67 TEETH. PINION 15 TEETH.
RATIO 4·46 ARMATURE SPEED = $\frac{\text{MILES PER HOUR}}{\cdot 0173}$



App P.J.P. Date March 15/21 Traction Eng Dept. CURVE No. 3 - 34 A.