General Electric Company
Schenectady, N.Y.

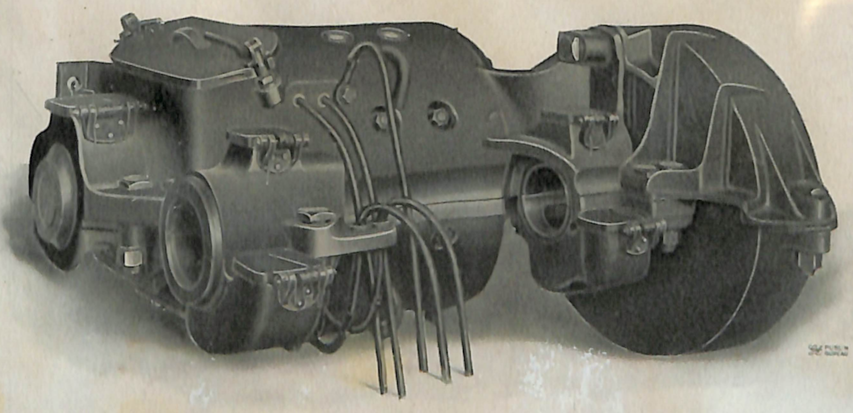
RAILWAY DEPARTMENT

May, 1908

Bulletin No. 4588

THE GE-202 RAILWAY MOTOR

The GE–202 motor is similar in design and construction to the latest standard GE railway motors, containing all improvements and in addition is provided with commutating poles. It is of very substantial construction with large armature and axle bearings, oil and waste lubricated bearings and three-point suspension gear case. The Form A frame is constructed so that the bottom half can be swung down into a pit for the inspection or renewal of parts.



GE 202 Motor, Axle Side

The commutating pole railway motor is especially adapted for use with higher operating voltages which have recently come into favor on many of the larger electric railroad systems. This is due to the good commutating and non-flashing properties inherent in this type of motor. These characteristics allow the overload to be considerably increased, and at the same time a more rugged form of a motor is obtained which will withstand the most severe service conditions and is less likely to be injured by misuse. The motor is therefore specially adapted for operation on heavy grades or with equipments geared for high speed work which have also to start and stop frequently in city service.

The following is a description of the Form A motor:

MAGNET FRAME

The frame is made of steel cast in bowl-shaped top and bottom halves machined along the edges and bolted together with four bolts. The two bolts on the suspension side are hinged so that the lower half can be swung down into a pit for inspection or cleaning, after the back bolts have been removed.

The main exciting pole pieces are bolted to the frame at an angle of about 45 degrees to the horizontal. The commutating pole pieces are bolted to the frame at points midway between the exciting poles.

Bails are cast on both upper and lower frames for handling the motor.

Small holes fitted with malleable iron covers and gaskets are provided at both ends of the motor for inspection, or ventilation whenever service conditions will permit.

The supporting brackets for the armature and axle bearings are located on the outside of the frame and are cast integral with the top magnet frame. The linings are held rigidly in the supporting brackets by means of caps which are bolted tightly against them.

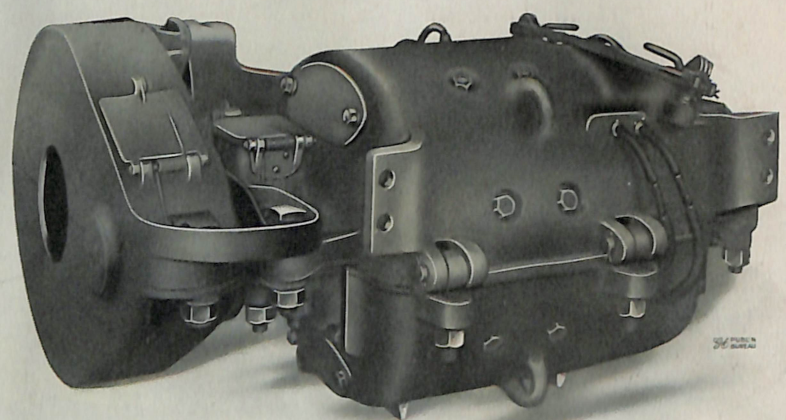
The opening over the commutator is inclined at an angle to allow the brush holders being readily reached either from under the car, or, if desired, through a trap door in the floor of the car. This opening is closed by a malleable iron cover with a felt gasket resting on a machined seat, the cover being held in place by a readily adjusted cam locking device. The armature and field leads are brought through rubber bushed holes on either the axle or suspension side of the motor as desired.

BEARINGS

All bearings are designed for oil and waste lubrication, as this system has met with great success for railway motors ever since its original introduction by the General Electric Company.

The armature shaft linings are bronze sleeves finished all over and lined with a thin layer of babbitt metal securely anchored and soldered in place. The babbitt metal furnishes an ideal bearing surface and is so thin that it will not allow the armature to rub on the poles in case it is melted out by overheating. In both axle and armature bearings the oily waste used for lubrication is packed in large oil wells and bears on the shaft through an opening in the side of the bearing linings.

Waste oil from the armature shaft bearings is prevented from entering the interior of the motor by deflectors which throw it into grooves from which it is conducted away.



GE 202 Motor, Suspension Side

This form of bearing is fully equal in simplicity and reliability to the standard box journal bearing. The method of lubrication and treatment is practically the same and the boxes are reached through large hand holes protected by swing covers with felt gaskets. The covers are held in place by strong springs.

The amount of oil required for the bearings is exceedingly small, and wide experience indicates that no other type of bearing equal to this has ever been placed on a railway motor.

The motor is constructed with very liberal wearing surfaces to insure a long life to the bearings and reduce wear and tear to a minimum. The armature shaft bearing is $2\frac{3}{4}$ in. in diameter, and $7\frac{1}{2}$ in. long at the commutator end, and $3\frac{1}{4}$ in. in diameter and $8\frac{1}{2}$ in. long at the pinion end. The lining on the commutator end is not split, but on the pinion end is split to permit of its removal without disturbing the pinion. The axle bearing linings are 9 in. long and made of malleable iron lined with babbitt metal for axle diameters up to and including 5 in.

FIELD COILS

The mummified type of main field coil and commutating coil is used. The coils are wound with asbestos covered wire and after receiving a wrapping of cotton tape are thoroughly filled with an insulating compound by the vacuum process. They are then thoroughly insulated with several wrappings of specially prepared tape, and as a final protection, chiefly against mechanical injury, are taped with a heavy cotton webbing and thoroughly filled with japan.

This method of construction for the coils makes them solid and compact and well adapted to radiate heat and withstand moisture. The small weight of the coils facilitates their handling and repairs are easily made in case of injury. The coils are securely clamped to the frame when the pole pieces are bolted in.

ARMATURE

The armature core is built up of soft iron laminations interspaced with air ducts which provide good ventilation.

The armature coils are wound on forms with insulation between the adjacent coils in the unit or polycoil which is pressed to shape in a steam mold. The coils are then covered with insulating material of high quality, and as a final protection, principally from mechanical injury, are taped and filled with an insulating compound. The windings are specially well protected from dust, oil or mechanical injury. The pinion end core head extends under the end windings with a flange reaching up past the ends of the coils. The windings at both ends are covered with a strong canvas dressing securely bound in place. In accordance with a long established practice of the General Electric Company, binding bands are not allowed to project above the armature core, and the ends of the band wires are secured by means independent of the solder.

COMMUTATOR

Conforming to the General Electric Company's standard practice, the commutator segments are made of hard drawn copper insulated throughout with the best grade of mica. The cone micas are built up and pressed hard and compact in steam molds. The mica between the segments is made of a softer quality to make it wear down evenly with the copper.

Great care is taken in the construction of the commutator. The cone surfaces are carefully machined and cleaned from burs and sharp edges to prevent short circuits between the segments, and creepage distances are made long to prevent grounding.

The shells and caps are made of cast steel in strong sections in order to prevent breakage and keep the shape of the commutator true. Before tightening the commutator nut, the segments are clamped tight by the cap which is pressed home in a hydraulic press.

The liberal wearing depth of the segments and the excellent commutation of the motor insures a long life to the commutator.

BRUSH HOLDERS

The brush holders, two in number, are made of cast bronze, and one brush is used per holder. The brushes slide in finished ways and are pressed against the commutator by independent fingers, which give a practically uniform pressure throughout the working range of the brushes.

The springs which actuate the fingers are designed so as to bear only slightly on the pin on which the fingers pivot, thus preventing any undue friction on the pin and reducing wear to a minimum.

There is a "pig-tail" or shunt between the fingers and the brush holder body to prevent current passing through the spring or pivoting pins. The brush holders are adjustable to allow for wear of the commutator. They are securely clamped in the proper position and can be readily removed through the opening in the frame over the commutator.

VENTILATION

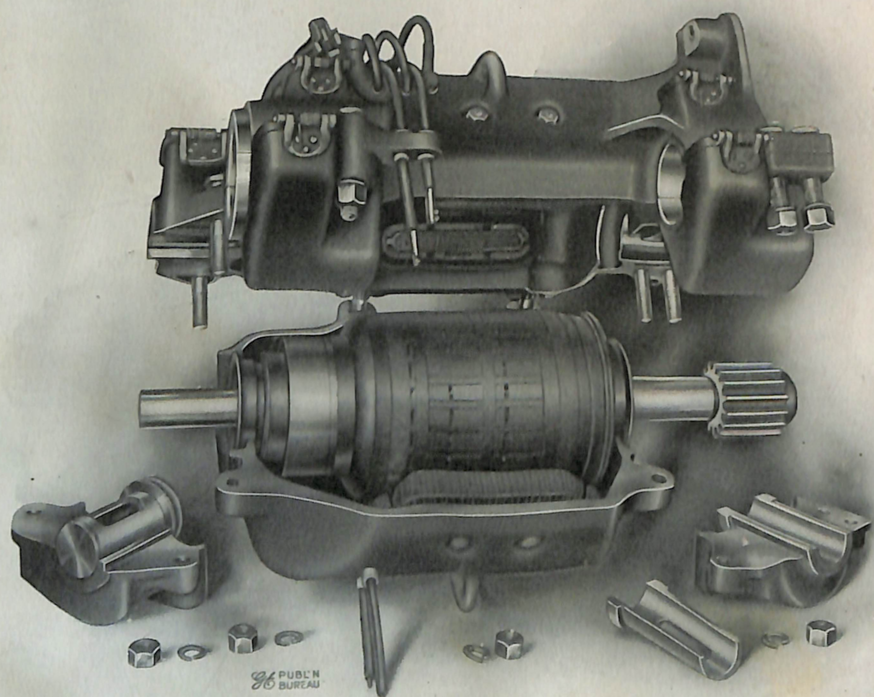
Particular attention has been given to ventilation. Free circulation of air between the interior and the exterior of the motor can be obtained as already described under the heading "Magnet Frame," by the removal of the malleable iron covers whenever service conditions permit.

Armatures are constructed so that when running, a large volume of air is drawn into the interior of the core and expelled through ducts opening along the exterior.

Good ventilation with the small electrical and mechanical losses obtained in these motors keep them cool and greatly add to their capacity in service. The ventilation is secured without sacrificing in any way the proper protection of the armature windings, a strong point in the construction of the motors.

GEAR, PINION AND GEAR CASE

The gears are made of a superior grade of cast steel, and the pinions from a special stock of forged steel, extra hammered to improve the quality of the metal. The gears have a 5 in. face and the teeth are accurately cut to a 3 pitch. The gear case is made of malleable iron and is suspended from the magnet frame at three points to prevent vibration. Strengthening ribs radiate from the supporting points to prevent the case from cracking. The case is bolted to the motor frame in such a way as to minimize lateral vibration, and the contact surfaces between the case and frame are made large to prevent undue wear.



GE 202 Motor. Frame Opened

The three-point suspension has proved so successful a feature in the operation of General Electric motors that it is considered a salient point in their design.

SUSPENSION

Lugs are cast on the upper half of the Form A frame to which the suspension bar is bolted. The lower half in the Form A motor frame can be swung down on the hinge bolts into a pit for inspection and repairs without disturbing the rest of the motor.

ADVANTAGES

The GE-202 motor has the advantages in regard to compactness and accessibility of parts for repair and inspection that exist in all standard GE railway motors.

In addition, attention is called to the following special qualities possessed by this motor which will commend it to all practical users of railway motors:

1. Very substantial mechanical construction.
2. Practically sparkless commutation even on heavy overloads.
3. Flashing at commutator largely reduced, if not entirely eliminated.
4. Less wear on commutator.
5. Cleaner and more reliable motor because of the reduced carbon and copper dust from brushes and commutator.
6. Marked reduction in heating of commutator.
7. Increased life of brushes.
8. Lower magnetic densities and smaller core loss.
9. Increased efficiency and free running capacity, because of lower core and commutator losses.
10. Lighter field coils to handle.
11. Greater service capacity of motors possible by forced ventilation.
12. Improved shape of speed curve, giving greater economy during acceleration.
13. Increased service reliability due to the elimination of commutator troubles and of delays consequent thereto.
14. Greater service reliability owing to the elimination of troubles in the car equipment due to the flashing of motors.

RATING

The capacity of the GE-202 motor for continuous service is high, owing to its good electrical efficiency and ventilation. The rating of the motor is based on a temperature rise by thermometer of not more than 75 degrees C. above the surrounding air taken at 25 degrees C., after an hour's run at the rated load of 50 h.p. on 600 volts. It has a liberal margin of safety at this voltage, as good commutation is a special characteristic of this type of motor.

This method of rating has been in use for a number of years, and while not necessarily giving an exact measure of the capacity of a motor to perform all classes of service, is convenient and well understood, and conveys a sufficiently close idea of the relative sizes of motors for general use.

A test is made on the motors at rated load, and all motors are also thoroughly tested for commutation, bearings, brush holders, etc.

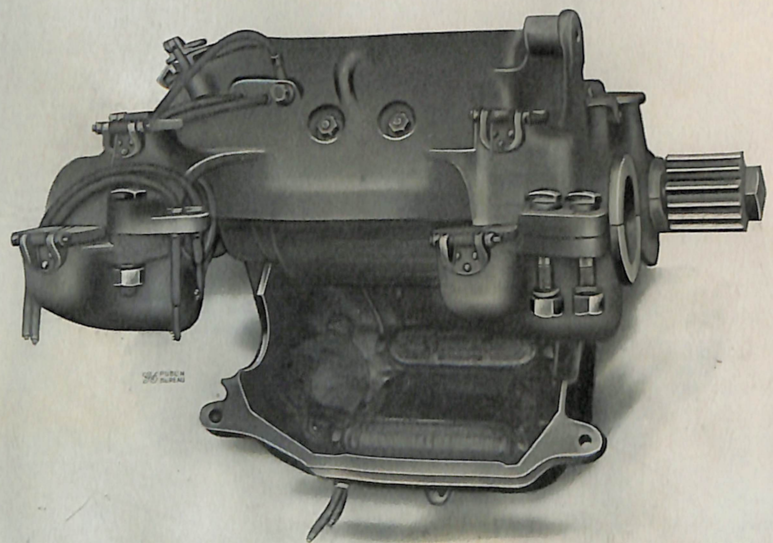
The predetermination of the capacity of a motor to perform a given service is a problem, the solution of which necessitates a complete knowledge of the mechanical, electrical, and thermal characteristics of the motor. Knowing these characteristics, it is possible to calculate the losses in a motor performing any specified service. The only way of determining how hot a motor will run is by reference to actual tests of the motor under the same or similar service conditions.

The heating of a given motor in service manifestly depends entirely on the character of the service, and consequently no reliable estimate can be made of the necessary capacity or characteristics of the motor for successful operation, without a complete knowledge of the operating conditions. The weight of the car or train, schedule speed, location, number and duration of stops, profile and plan of road, and voltage, are necessary for a complete and careful analysis of the problem.

In order to obtain full information on these questions, the General Electric Company besides carefully testing each type of motor for efficiency, I^2R, core and friction losses, speed and commutation, etc., at various voltages

type of motor, the Company's engineers possess all the information required to determine with practical certainty, the adaptibility of the motor to handle any specified service, and the problem has become not a matter of guess work, but of calculation.

As the power required to operate an equipment affects not only the heating of the motors but also the total amount and cost for operating the road, careful calculations are made to determine the most suitable characteristics of a motor for a given service and the most



GE 202 Motor. Lower half of Frame swung down

and amperes, also makes exhaustive tests to determine the capacity of motors for heat dissipation under operating conditions. For this purpose motors are put into actual service on the Company's experimental track (more than two miles in length) and are run day after day under a wide range of known service conditions, careful temperature measurements being taken until sufficient data are obtained to show what temperature different parts of the motor will reach, not only with various total losses but also with different distributions of these losses.

From the data obtained in the above tests, which cover all the characteristics of a given

economical gear ratio to use. The possibilities of saving power by the careful design and proper selection of the gear ratio are much greater than ordinarily appreciated.

A table which is based on tests, such as have been described above, will be found on page 9 showing schedule speeds for various gear ratios with varying number of stops per mile and different weights per motor. This table has been prepared to enable customers to determine quickly and with considerable accuracy the capacity of the GE–202 motor to handle cars or trains under ordinary service conditions, and it will also be found useful for laying out operating schedules.

As the reputation of the General Electric Company's motors and the interests of its customers are affected by the proper selection of motors for any given service, the Company desires to aid and co-operate with its customers in selecting motors best adapted for their service. For this purpose, customers are furnished with blank service data sheets to fill out so as to show the character of the service which it is desired to operate. The Company's great experience enables it to render valuable assistance in this class of work, and long experience has shown that co-operation is mutually beneficial.

The blank form on page 14 will be gladly furnished to prospective customers.

Speed torque and efficiency curves for the GE–202 motor, with various gear ratios corresponding to the gear ratios given in the table, will be found on pages 10 to 12.

These curves are convenient for general reference.

The diagram of the motor on page 13 which shows the external dimensions and axle preparation, will enable truck builders and car manufacturers to adapt their trucks and cars for the proper reception of the motor.

The table on page 9 giving the estimated schedule speeds in miles per hour for the GE–202 motor is calculated on the basis of a 600-volt line pressure at the motors.

The duration of each stop has been taken as 10 seconds.

The maximum temperature rise of the motors above the surrounding air has been taken as not more than 65 degrees C. with the motors closed, this temperature being based on the operation of motors under average normal conditions. Though the temperature rise will not usually exceed the estimate of 65 degrees C., it should be noted that this temperature rise cannot be guaranteed, as motor temperatures depend on the manner in which motormen handle the equipments.

For convenience in knowing what schedules can be made in the city by high speed interurban equipments, schedules have been given which in some cases it will be found physically possible to exceed, but which should not be exceeded for any length of time.

If it is of importance to make better schedules than those given for the high speed equipments in city service, full information should be furnished the General Electric Company for complete analysis.

When applying the tables to services requiring two or more different schedules, such as a city service with many stops per mile combined with a suburban or interurban service with but few stops per mile, the schedule for each class of service should be taken separately and a resulting schedule for the combined service obtained.

The schedule speeds given in the table are based on the operation of motors under favorable conditions, and are at least 10 per cent. below the theoretical speeds, in order to allow for the normal delays due to curves, grades, slow-downs, etc.; in other words, it is assumed that the delays due to these causes will equal six minutes in every hour. If this allowance is considered insufficient, due to special local conditions, the schedule should be reduced 1.85 per cent. for each additional minute of delay. The improper handling of the cars or excessive track or car friction may also reduce the schedule, and this will also be the case if, in addition to the regular stops, there is an unusual number of slow-downs, curves or grades. If curves and grades are numerous or excessive, or the conditions are special or abnormal and an extensive analysis is necessary, complete information should be furnished to the General Electric Company before deciding on the motor equipment to be used. The schedule speeds given in the table should be decreased by the percentages given below for any voltages below 600. For each 1 per cent. reduction in the voltage, there will be approximately the following reduction in the schedule:

1 stop per mile	.5%
3 stops per mile	.2%
7 stops per mile	.1%

When the voltage is greater than 600, the schedule may be increased by approximately the same per cent. as it is decreased for a reduction of voltage. It should, however, be borne in mind that there will be an increase in temperature at the higher voltages and schedules. Nevertheless, as there will be somewhat less heating of the motors at a lower voltage and schedule, it is permissible to increase the schedule on parts of the line by increasing the voltage, providing there is a corresponding decrease in the voltage on the other portions.

As the number of stops per mile increases, the schedules that can be made with the same car weights, but with different speed gears, become more nearly equal.

When the same schedule is made with different speed gears, the heating of the motors is less with the low speed than with the high speed gear.

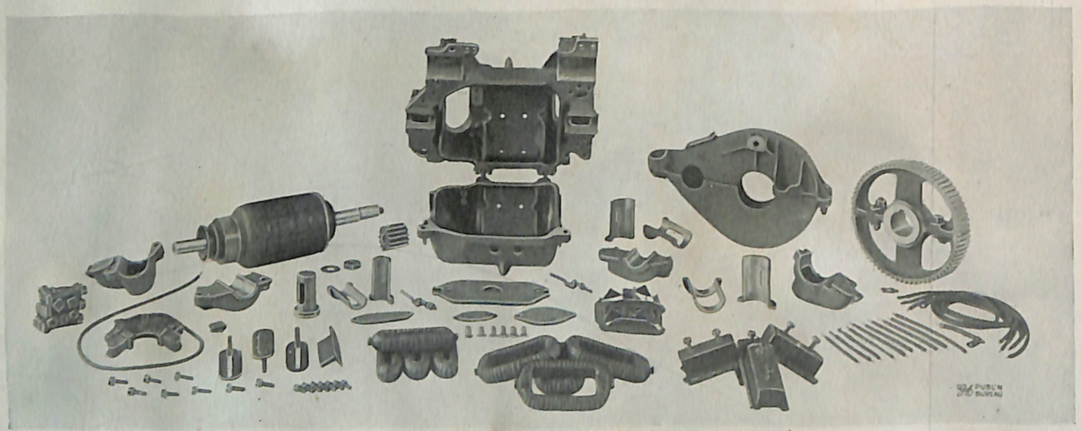
Under ordinary service conditions the watt-hours per ton mile for a given schedule are less with a low than with a high speed gear. Therefore, in order to operate with the lowest power consumption and also with the minimum heating of the motors, the lowest speed gear, that is, the highest gear ratio which will make the required schedule, is generally best suited for a given service.

The tractive effort is taken at 23 lb. to 38 lb. per ton, depending on the speed and weight of the car. An examination of the motor curves will show the tractive effort assumed for the various speeds.

In determining "Tons per Motor" the total weight of the car or train, including the load, motors, controllers, rheostats, etc., divided by the number of motors, should be taken.

In ordinary service the average and not the maximum load should be taken. The average passenger load may be represented by the seating capacity and the average weight per passenger can be assumed to be 140 lbs. If the motors operate with maximum load for a large part of the time, the maximum and not the average load should be taken.

The tables do not apply when the motors are used for electric braking, as the heating of the motors is increased thereby.



Parts of GE 202 Motor

APPROXIMATE WEIGHT IN POUNDS

Motor complete with gear and gear case	2604 lbs.
Two-Motor Equipment, complete with two controllers .	6433 lbs.
Two-Motor Equipment, complete with Sprague-General Electric Type M control .	7008 lbs.
Four-Motor Equipment, complete with two controllers .	12666 lbs.
Four-Motor Equipment, complete with Sprague-General Electric Type M control .	12816 lbs.

GEAR RATIOS
CHARACTERISTIC CURVES, ETC.

Gear ratios with characteristic letters and numerals corresponding with three-turn armatures and 60-turn fields are as follows:

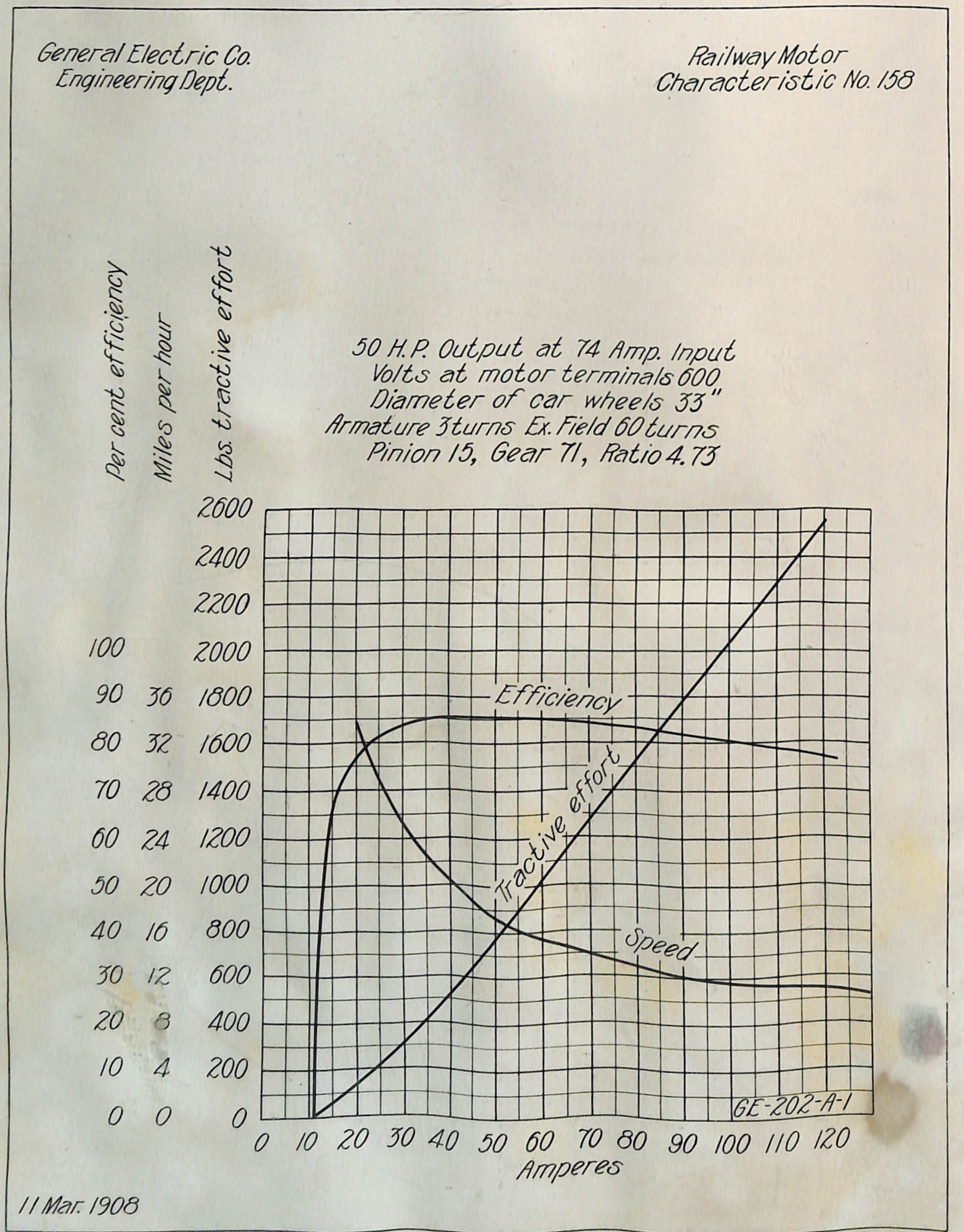
Pinion	Gear	Gear Ratio	Classification	Characteristic No.
15	71	4.73	GE-202-A-1	158
17	69	4.06	GE-202-A-2	159
19	67	3.53	GE-202-A-3	160

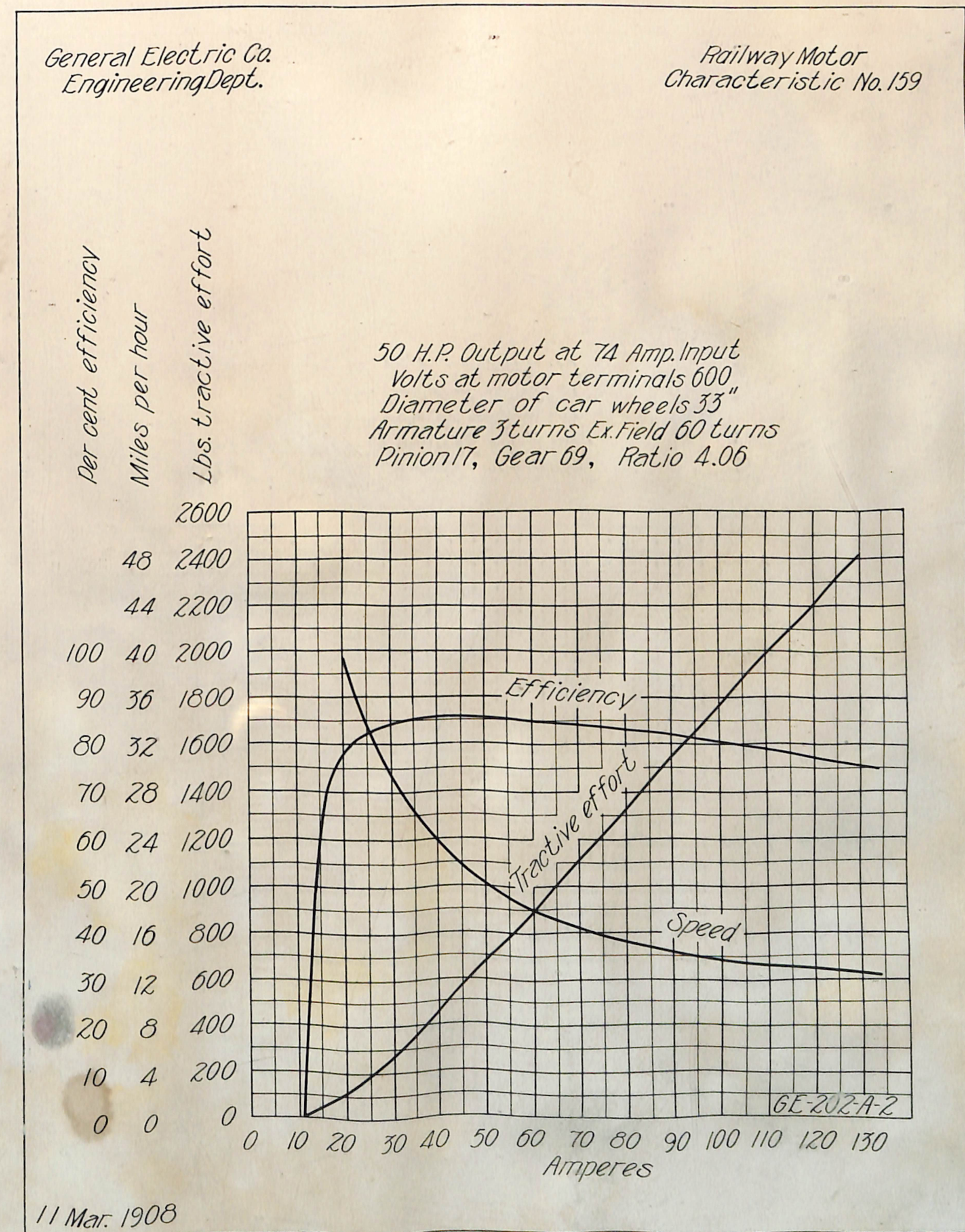
SCHEDULE SPEED GE-202 MOTOR
Arm. 3- Turns- Fields: Exc. 60 Turns- 600 Volts- 33 in. Wheels

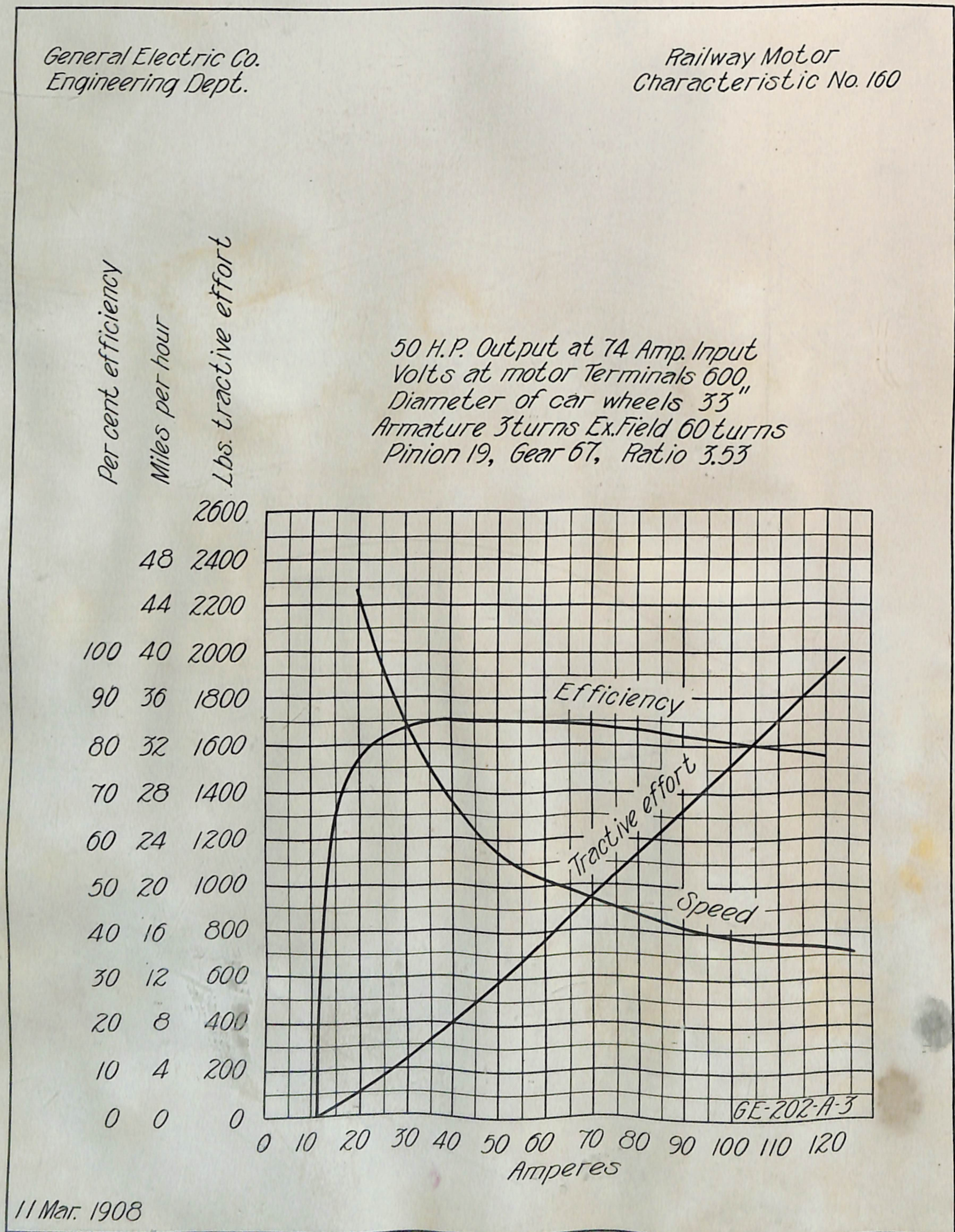
Read Bulletin Carefully before Applying Table

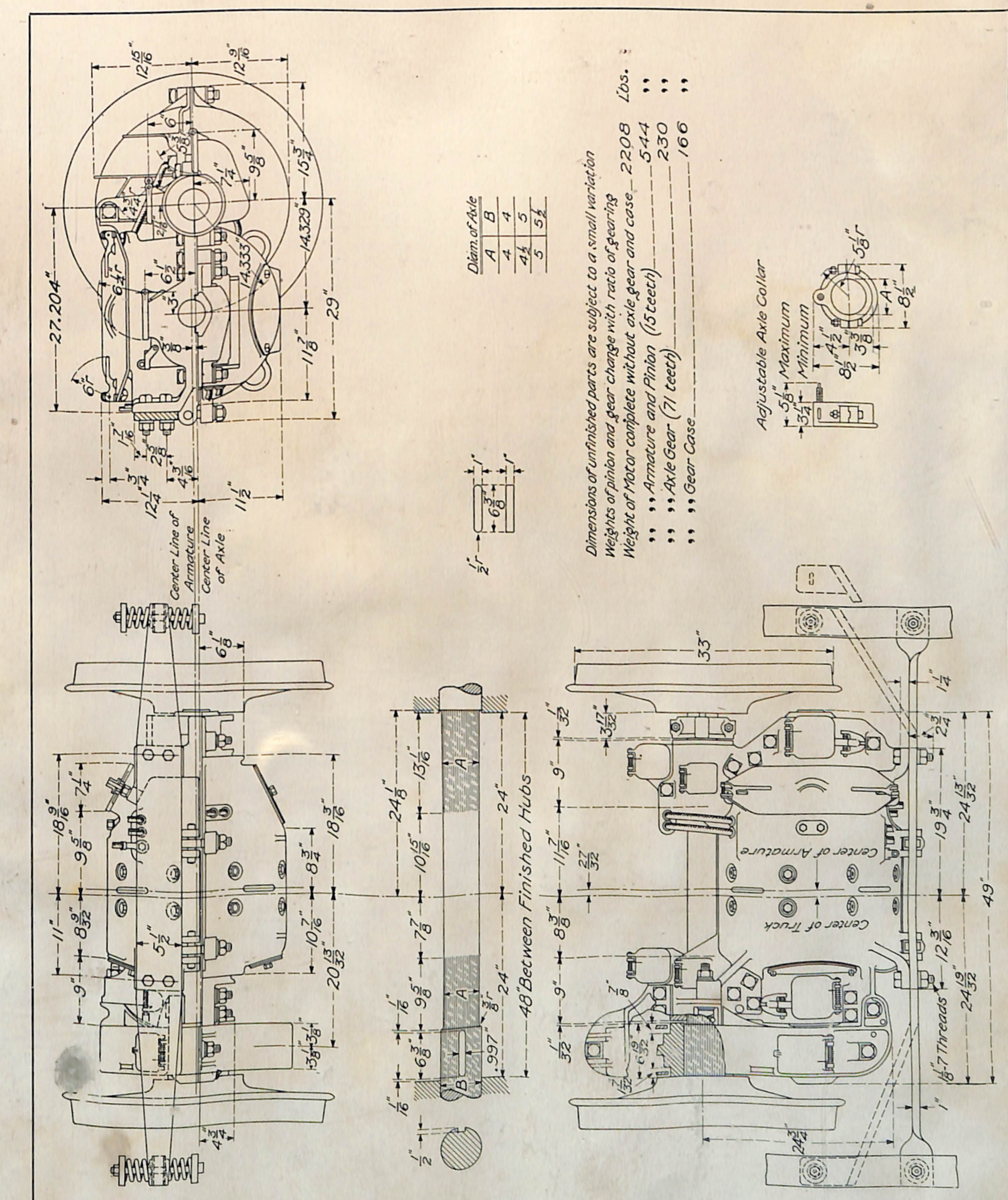
Stops per Mile	Gear Ratio	TONS PER MOTOR									
		4.5	5	5.5	6	6.5	7	8	9	10	11
1/4	4.73	26.2	25.8	25.6	25.3	25.	24.8	24.3	23.8	23.3	22.8
1/4	4.06	28.8	28.4	28.	27.7	27.3	27.	26.4	25.8	25.4	25.
1/4	3.53	31.4	31.	30.5	30.	29.6	29.1	28.3	27.6	27.1	26.7
1/2	4.73	24.6	24.2	23.8	23.6	23.3	23.	22.6	22.2	21.7	21.3
1/2	4.06	26.9	26.5	26.1	25.8	25.4	25.1	24.5	24.	23.6	23.2
1/2	3.53	28.8	28.4	28.	27.6	27.1	26.7	26.	25.5	25.	
1	4.73	21.8	21.4	21.1	20.8	20.5	20.3	19.9	19.5	19.1	18.7
1	4.06	23.	22.8	22.5	22.3	22.1	21.9	21.4	21.1	20.8	20.5
1	3.53	24.1	23.9	23.6	23.4	23.1	22.9	22.4	22.1		
2	4.73	18.	17.5	17.1	16.8	16.5	16.3	15.8	15.5	15.2	14.8
2	4.06	18.3	18.2	18.1	18.	17.8	17.7	17.5	17.3	17.1	
2	3.53	18.8	18.7	18.5	18.4	18.3	18.1	17.9			
3	4.73	14.8	14.6	14.3	14.2	14.	13.8	13.6	13.3	13.1	12.8
3	4.06	15.6	15.5	15.4	15.3	15.1	15.	14.8	14.6		
3	3.53	15.7	15.6	15.5	15.4	15.4	15.3				
4	4.73	13.	12.8	12.7	12.6	12.5	12.4	12.2	12.	11.8	
4	4.06	13.5	13.4	13.3	13.2	13.1	13.	12.8			
4	3.53	13.6	13.6	13.5	13.4	13.4	13.3				
5	4.73	11.6	11.5	11.4	11.3	11.2	11.1	11.	10.9	10.8	
5	4.06	12.	12.	11.9	11.8	11.7	11.6	11.4			
5	3.53	12.2	12.1	12.	12.	11.9	11.8				
6	4.73	10.7	10.5	10.3	10.2	10.2	10.1	10.1	10.		
6	4.06	10.9	10.8	10.7	10.6	10.6	10.5	10.3			
6	3.53	11.	11.	10.9	10.8	10.8	10.7				
7	4.73	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.3		
7	4.06	10.	9.9	9.8	9.7	9.7	9.6	9.4			
7	3.53	10.	10.	9.9	9.8	9.8					
8	4.73	9.2	9.1	9.	9.	8.8	8.8	8.7	8.6		
8	4.06	9.2	9.1	9.1	9.	8.9	8.8	8.7			
8	3.53	9.3	9.2	9.1	9.	8.9					
Max. Speed Double Equipment	4.73	32.5		31.5		30.5		29.5		28.5	
	4.06	36.		35.		34.		32.5		31.	
	3.53	38.5		37.5		36.5		35.			

Max. speed four-motor equipment 5 to 10% faster for same tons per motor.


General Electric Co.
Engineering Dept.
Railway Motor
Characteristic No. 158
50 H.P. Output at 74 Amp. Input
Volts at motor terminals 600
Diameter of car wheels 33"
Armature 3 turns Ex. Field 60 turns
Pinion 15, Gear 71, Ratio 4.73
Per cent efficiency
Miles per hour
Lbs. tractive effort
Efficiency
Tractive effort
Speed
Amperes
GE-202-A-1
11 Mar. 1908


General Electric Co.
Engineering Dept.
Railway Motor
Characteristic No. 159
50 H.P. Output at 74 Amp. Input
Volts at motor terminals 600
Diameter of car wheels 33"
Armature 3 turns Ex. Field 60 turns
Pinion 17, Gear 69, Ratio 4.06
Per cent efficiency
Miles per hour
Lbs. tractive effort
Efficiency
Tractive effort
Speed
Amperes
GE-202-A-2
11 Mar. 1908





Dimension Diagram. GE 202 Motor

GENERAL ELECTRIC COMPANY SERVICE DATA SHEET FOR RAILWAY EQUIPMENTS

on the..Railway.

MOTOR CARS: (OPEN OR CLOSED).................... No. of motors per car....................

Weight of empty cars and trucks *not* including electrical equipment..................tons (2000 lbs.)

Length of car over all,.......... Length of car body,.......... Seating capacity,..................

Capacity with standing load,.................. If open car give number of benches,..................

Have cars single or double trucks?............Diameter of car wheels is..................inches.

TRAIL CARS: (OPEN OR CLOSED)....................

Weight of empty cars and trucks..........tons (2000 lbs.) Length of car over all,..............

Length of car body,.......... Seating capacity,.......... Capacity with standing load,..........

No. of trail cars handled by motor car,.............. Hours during which trail cars are operated,..............................

LINE POTENTIAL: Maximum voltage is.............. Minimum voltage is.............. Average voltage is....................

TIME: (excluding layovers) required to make round trip................minutes. Length round trip....................miles.

Distance **round trip** in city service................miles. Suburban................miles. Interurban................miles.

STOPS: Average number on **round trip** in city service is................ Suburban is................ Interurban is................

(It is assumed that the average duration of stops will be 10 seconds each.)

LAYOVERS: (If any) number and duration..

....

....

GRADES: Underscore grades which cars both ascend and descend in round trip.

Length in ft.	%	Length in ft.	%	Length in ft.	%	Length in ft.	%	Length in ft.	%

REMARKS (Pertaining to character of service not covered above, particularly with reference to curves and slowdowns.)

Dated....................................19........ Signed..

By..

GENERAL ELECTRIC COMPANY

PRINCIPAL OFFICES, SCHENECTADY, N. Y.

SALES OFFICES:

BOSTON, MASS., 84 State Street.
NEW YORK, N. Y., 30 Church Street.
SYRACUSE, N. Y., Sedgwick, Andrews & Kennedy Bldg.
BUFFALO, N. Y., Ellicott Square Building.
NEW HAVEN, CONN., Malley Building.
PHILADELPHIA, PA., Witherspoon Bldg.
BALTIMORE, MD., Continental Trust Building.
CHARLOTTE, N. C., Trust Building.
PITTSBURG, PA., Park Building.
ATLANTA, GA., Empire Building.
NEW ORLEANS, LA., Hennen Building.
CINCINNATI, OHIO, Perin Bldg., Fifth and Race Sts.
COLUMBUS, OHIO, Columbus Savings & Trust Bldg.
CLEVELAND, OHIO, Citizens Building.
NASHVILLE, TENN., Stahlman Building.
CHICAGO, ILL., Monadnock Building.
DETROIT, MICH., Majestic Bldg. (Office of Soliciting Agt.)
ST. LOUIS, MO., Wainwright Building.
KANSAS CITY, MO., 2114 Central Street.
OKLAHOMA CITY, OKLA., Culbertson Building.
DALLAS, TEXAS, Scollard Bldg. (Office of Soliciting Agt.)
HELENA, MONTANA, Power Block.
DULUTH, MINN., Providence Building.
MINNEAPOLIS, MINN., Phœnix, Building.
DENVER, COLO., Kittredge Building.
SALT LAKE CITY, UTAH, Dooly Building.
SAN FRANCISCO, CAL., Union Trust Building.
LOS ANGELES, CAL., Delta Building.
PORTLAND, ORE., Worcester Building.
SEATTLE, WASH., Alaska Building.

FOREIGN:

FOREIGN DEPARTMENT,
Schenectady, N. Y., and 30 Church St., New York, N Y.
LONDON OFFICE, 83 Cannon St., London, E. C., England.

For all CANADIAN Business,
Canadian General Electric Company, Ltd.,
Toronto, Ontario.