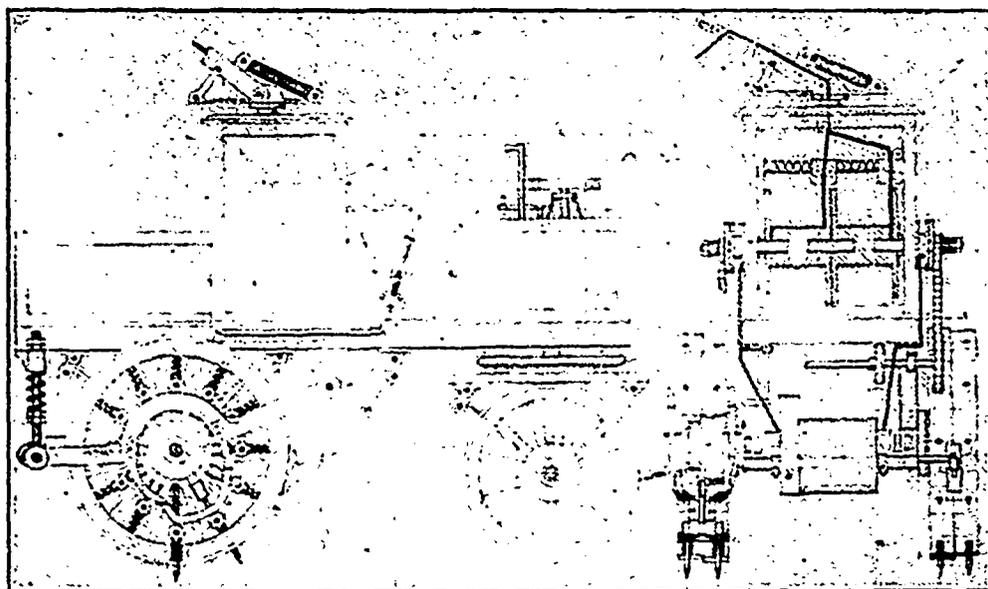


neighborhood of two horse-power to draw a plough at the rate of four miles per hour, it seems evident that these engines when drawing six ploughs, work considerably beyond their rated capacity; assuming that it will require two horse-power to a plough, it would take 12 horse-power to draw the ploughs, and nine horse-power to draw the wagon, making 21 horse-power in all that would be used when ploughing on a level field. Although this showing is very good, the following brief calculation will show how the steam traction engine fails on hilly ground. The power required to run the traction engine alone up a grade at the rate of four miles per hour, assuming that it weighs 14,000 lbs., will be about $1\frac{1}{2}$ horse-power for each 1 per cent. of grade; it will, therefore, be seen that on a grade of 4 per cent., six horse-power will be required to overcome the grade, and only six horse-power would be left for drawing ploughs; or in other words, three ploughs would be drawn on a 4 per cent. grade. On an 8 per cent. grade, it would take 12 horse-power to propel the

pounds would have sufficient traction, assisted by the anchor-spikes, to draw 14 ploughs up a grade of eight per cent., on a similar grade the steam traction engine at the best could only run itself.

This wagon or truck has suitably designed steering gear in connection with its front wheels and an electric railway motor geared to its rear driving wheels. The electric current for driving the motor is conveyed to it by means of a double circuit insulated, stranded cable; a reel of this cable is fixed on the wagon, the fixed end of the cable is attached to the motor, and the loose end to the source of electric supply. As the wagon travels forward over the field the cable unwinds, the slack lying on the ground; as the wagon comes back it picks it up again, the reel doing this automatically without any attention from the driver. The driving wheels have self cleaning spikes, which are quickly adjusted so as to sink into the ground any depth that may be necessary to give the wheels whatever grip on the ground may be required to prevent them from slipping. The



engine, and there would be nothing left to draw the ploughs; that is to say, on an 8 per cent. grade the engine would be practically stalled when running light, and on a 6 per cent. grade would barely pull one plough.

The electric engine, on account of its lightness, would probably be free from this defect. Assuming the weight of the wagon to be 5,000 pounds, and assuming that in consequence of the increased resistance of rolling over the ground, due to the spikes on the wheels, that it would take half as much power again as a steam traction engine for equal weights, that is to say, 9 per cent. resistance against 6 per cent. for the steam traction engine, it would then, on this assumption, require about five horse-power to propel the wagon over the ground. This deducted from the 37 horse-power would leave 32 horse-power (net), which would draw 16 ploughs over a field, assuming each plough to require two horse-power, as was assumed in the case of the steam traction engine. The power required to propel the wagon up the grade at the rate of four miles per hour, the weight being 5,000 pounds, would be at a rate a trifle over a half horse-power for each one per cent. of grade; therefore, on a four per cent. grade, the additional power absorbed would be two horse power, leaving 30 horse-power available, which would draw 15 ploughs. On an eight per cent. grade there would be 28 horse-power available, which would draw 14 ploughs; thus it seems that if a wagon with a weight of 5,000

wagon can go anywhere within the reach of its cable, and as the wagon will not weigh more than 4,500 pounds, only a comparatively small proportion of its power will be consumed in propelling dead weight. The wagon has a normal pull equal to 22 span of horses; this power the motor will double, treble or even quadruple for a short time, when necessary, as in going up a hill, doing it automatically without any attention from the driver. This capacity of the electric motor to overcome increased resistance by power increased in proportion to it, is a feature of great value; it is a power only possessed to a limited extent by horses, and makes the electric motor exceptionally well adapted for the purposes intended.

The wagon will haul gangs of ploughs, harrows, rollers, seeders singly or in combination; it will push or pull mowers, tedders and hay loaders, reapers and binders, or reapers and threshers combined, loaded wagons, etc.; on account of its broad tires and light weight, it will plough land so wet and soft that horses would stick in it.

In many localities water power can be utilized to generate electricity for cultivating the surrounding land, and as electric roads become extended through the country the trolley wire can be used as the source of electric supply; but in order that the electric wagon should be independent in its movements, it will be necessary that it should have a portable boiler and engine