ELECTRICALLY-DRIVEN TARGET TRAINS IN THE GERMAN ARMY.

BY DR. ALFRED GRADENWITZ.

The officers of the German army have long realized that moving targets are quite indispensable for the training of artillery. Hitherto targets have been used which were pulled either by horses, by horse-driven capstans, or by stationary steam engines. As all of these three methods are inconvenient, another outfit for the moving of targets was sought.

Fowler steam traction engines were eventually adopted to transport the machinery required for moving the targets, and likewise to supply the necessary energy.

The plant includes two steam road locomotives, two battery vans, two capstan vans, and one water van or portable water tank for carrying feed water.

In addition to transporting the remaining vehicles to the proving ground, the engines serve for the charging of the accumulator batteries installed in the battery van, for which purpose a dynamo, driven through belt transmission from the flywheel, has been installed on a platform in front of the steam boiler. The steam boiler of the traction engine is designed for a working pressure of 180 pounds, and is equipped with compound steam cylinders, insuring a practically noiseless exhaust and high economy with respect to the water and coal consumption. The engine has toothed gearing for two traveling speeds in addition to a differential gearing for traveling on sharp curves. On the axle of the rear running wheel has been installed a rope winch with 445 feet of wire rope, which winch is directly operated by the engine, and serves for hauling the battery, capstan vans, and other heavy loads. This device excludes any possibility of involuntary stoppage to the cars, which are about 13,200 pounds in weight.

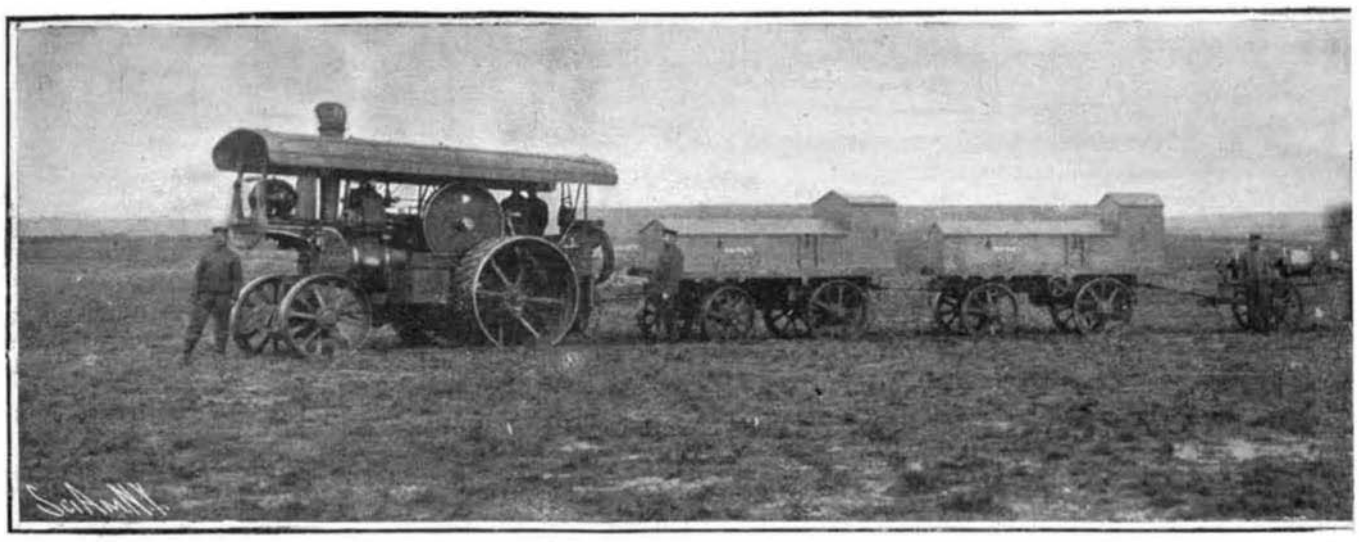
The water tank has a capacity of 190 gallons, and the coal tank accommodates 550 pounds of coal. The capacity of the engine is 30 I.H.P. The dynamo is a shunt-wound machine of a normal capacity of 10 kilowatts, with 1,250 R.P.M. and 230 volts.

Each battery van carries sixty cells located in hard-rubber boxes, held in two wooden trays with acid-proof lining.

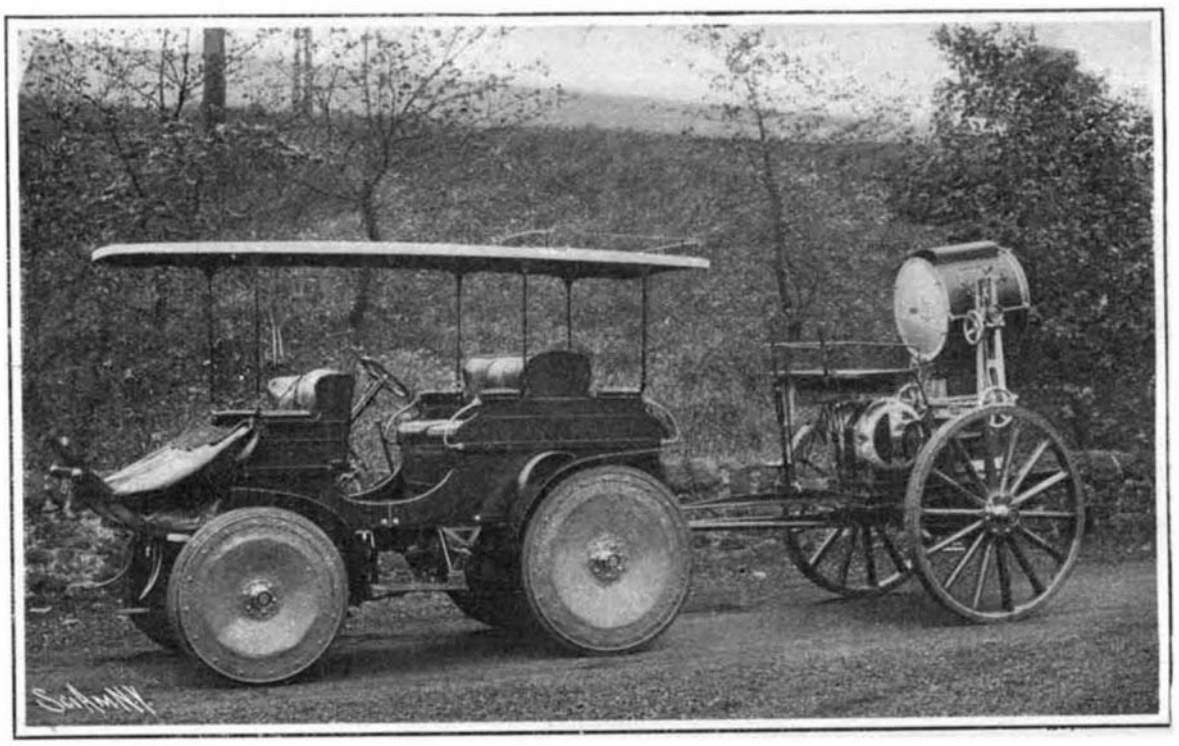
Each capstan van carries on a shaft located in five bearings four rope drums, each of which is able to receive about 8,200 feet of wire rope of ¼ inch diameter. An automatic device insures a smooth winding of the wire rope. The shaft of the wire rope drums is driven by two electric motors. The targets, which are moved forward, backward, or sideways at a speed corresponding with the conditions actually obtaining in real military operations, represent infantry, cavalry, and artillery. They are made of some light stuff such as pasteboard and linen, and are about the natural size of a man or a vehicle with its horses. They are carried on a sled, the upper frame of which is connected with the lower by hinges, so as to allow of its being turned around at a moment's notice, in case advancing or retreating infantry is to be represented. Special arrangements have been provided to cause the upper frame to drop as soon as the displacement is discontinued, while other targets representing riflemen become visible at the same time. The approximate speed of the targets is recorded by a tachometer driven from the drum shaft.

The whole outfit is used either combined or in two sets of one battery van and one capstan van each at two different places. In case cavalry targets are to be given a speed higher than 400 yards per minute, the dynamo will have to be resorted to, while accumulator battery operation is otherwise quite sufficient.

In one of our illustrations is shown a complete plant in course of transportation on the Münster (Hanover) proving grounds. Instead of the second traction engine this plant includes, however, an old petroleum locomobile, which is used only as a makeshift. The car behind the latter is a tool car, which is not required in the more recent plant described above, where any tools are arranged in special boxes. The traveling speed of a similar train obviously depends to a high extent on the conditions of the ground and weather, ranging in most cases between 10 and 25 miles per hour in the country. The same plant is represented in course of operation in a second engraving. The capstan cars are driven by the accumulator batteries, while the dynamos of both the road locomotive and the petroleum locomobile are at work supplying additional energy and instantaneously making up for any used-up current. It should, however, be remembered that the dynamos are resorted to only in exceptional cases.



A Complete Plant for Transporting Traveling Targets as Used by the German Army. S



An Automobile-Driven Field Searchlight Outfit.

THE KRIEGER SEARCHLIGHT AUTOMOBILE

The new Krieger car is of the type known as gasoline electric, in which the usual form of gasoline motor is applied in connection with an electric outfit. This combination gives several advantages. The principle of the new car is as follows: In the front of the chassis is mounted a gasoline motor which is direct connected to a dynamo. The latter is used to supply current to the motors which are mounted directly against the rear whe without usir tial, as ther for each wh tors are thu by the curr dynamo.

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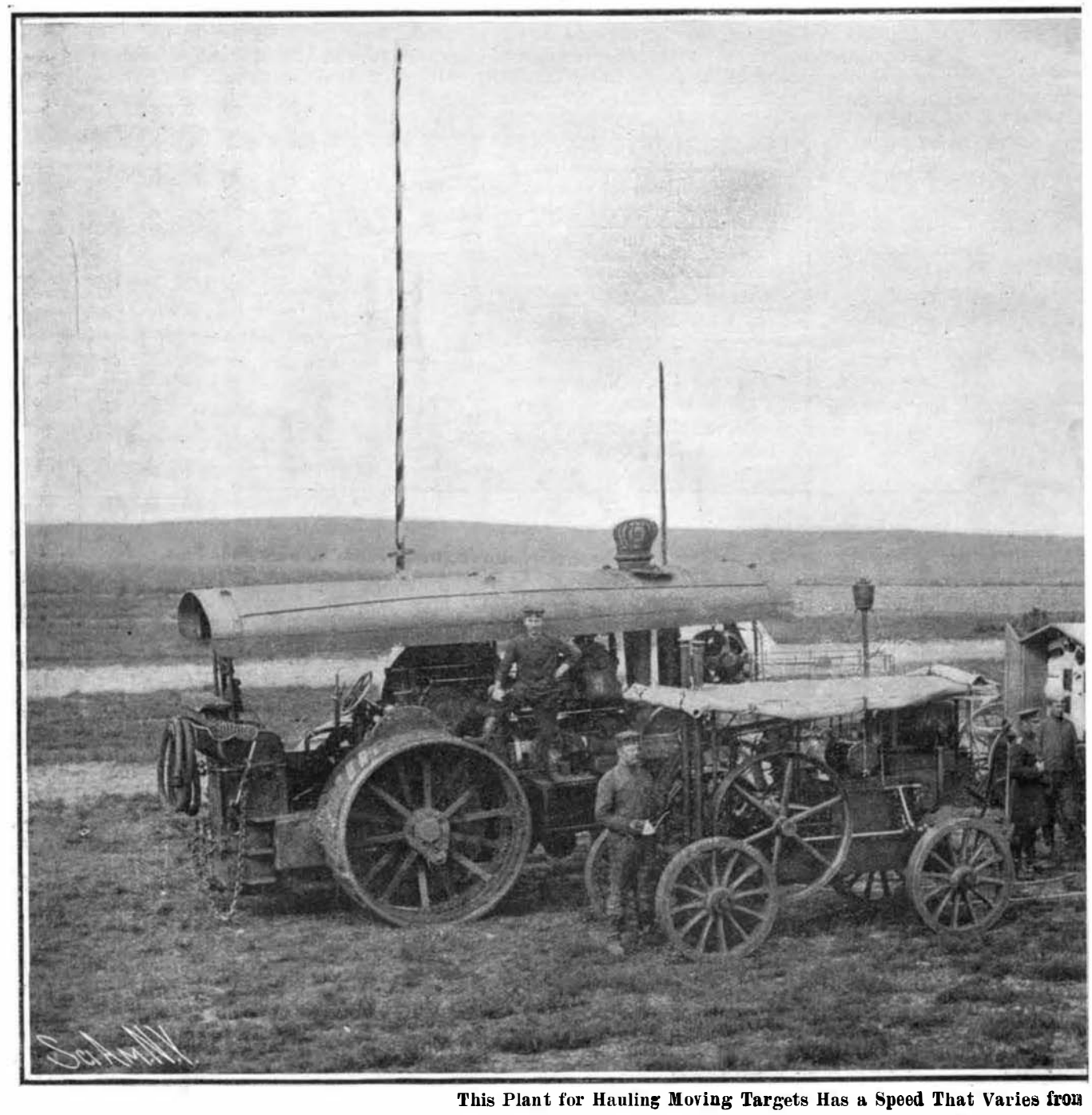
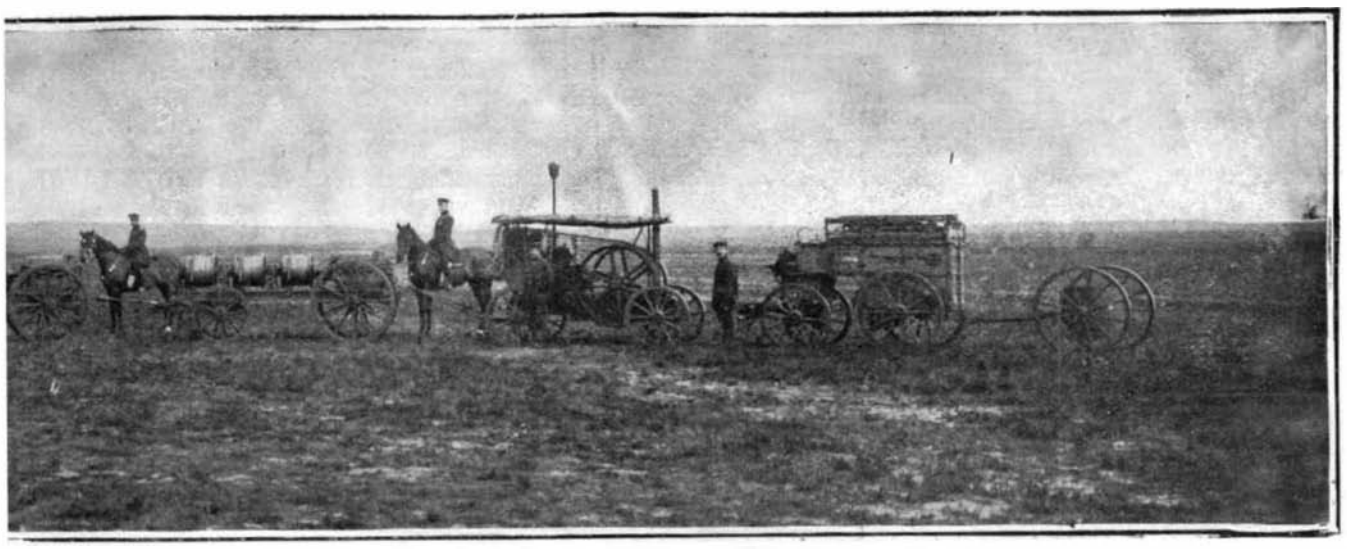


This Plant for Hauling Moving Targets Has a Speed That Varies from



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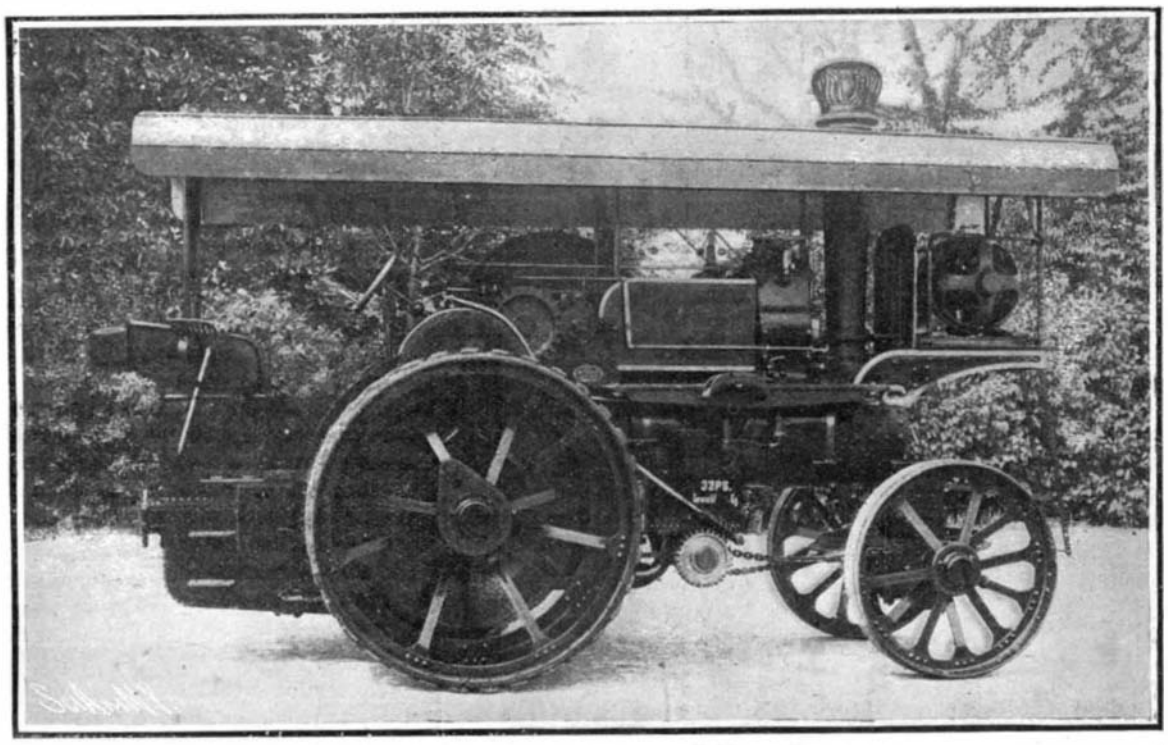
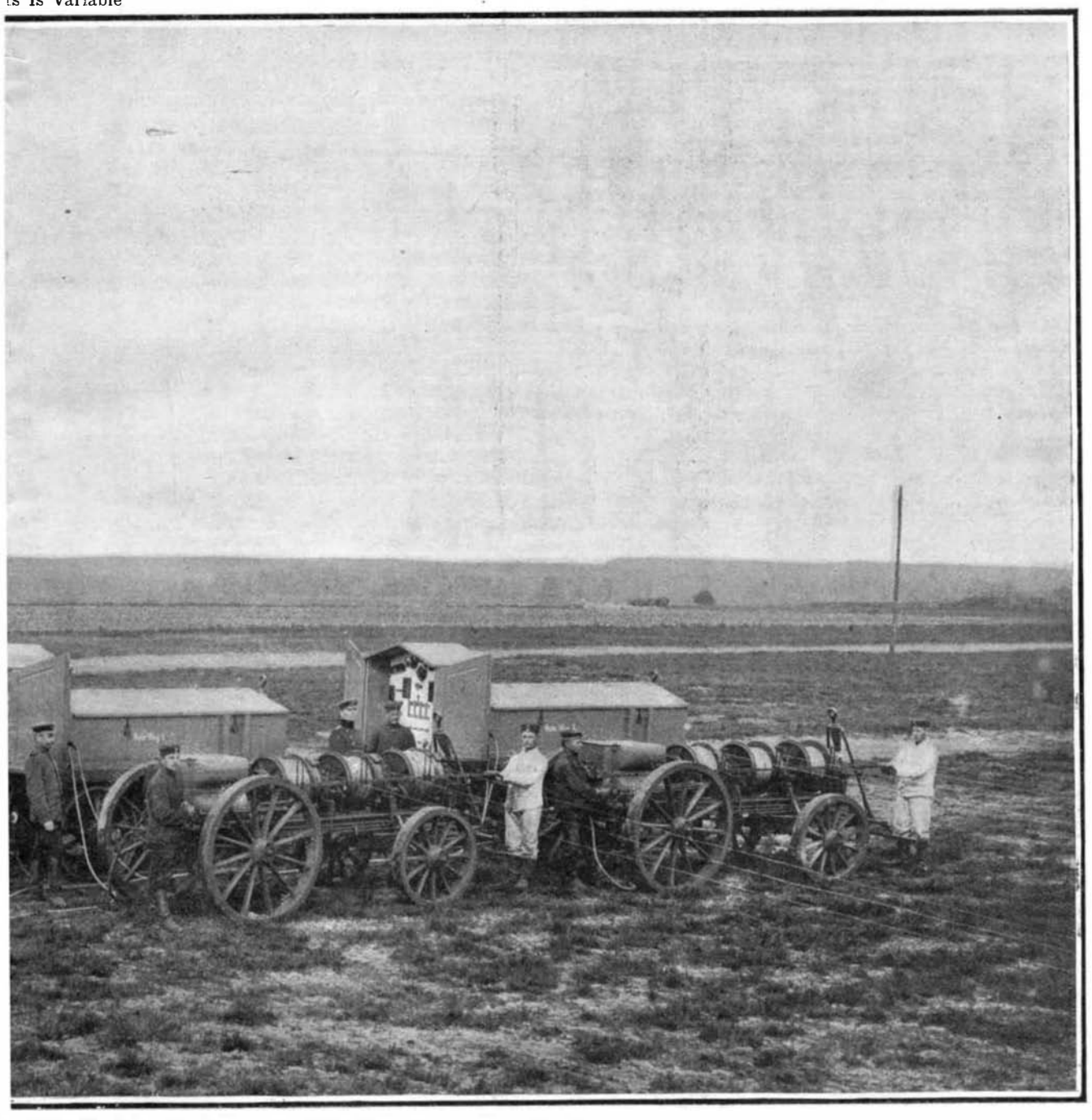


A Fowler Traction Engine Used for Military Purposes.



1 10 to 25 Miles an Hour, Depending Upon the Nature of the Ground.
TRAINS IN THE GERMAN ARMY.

and therefore the current varies in proportion, the electromotive force of the dynamo must be made to vary in the inverse sense from the current in order to keep the power constant. This is carried out by using a method of regulation upon the field magnets of the dynamo, which are provided with a separate winding for the purpose. The field of the dynamo is produced, in fact, by three different coils—first, a shunt winding whose effect varies with the electromotive force at the terminals; second, an independent circuit in which the current is supplied from a small storage battery of 60 pounds; and third, a special "demagnetizing" coil which consists of a few turns of a series winding upon the main current circuit of the dynamo. The automatic regulation of the field is carried out by the demagnetizing coil, which varies the electromotive force in the inverse sense from the current.

The storage battery serves to give a constant magnetizing effect and thus to avoid a possible absence of current which might result from an overload on the car, in which case the electromotive force might fall too low. It also serves at starting to set the motor group in movement by making the dynamo run as a motor, thus starting the car with no trouble.

To vary the speed of the car independently of the automatic regulation, we may act upon the gas inlet of the gasoline motor, thus cutting down the current of the dynamo. In this case the rear motors can be run down to a full stop, but the gasoline motor keeps on running, and the least increase of speed will set the electric motors working and start up the car. The above arrangement gives a much lighter car than an accumulator automobile, and it has a number of advantages, among which is an easy running of the car owing to the suppression of the gear-box, differential, and other mechanism. For the same reason the efficiency of the Krieger car is higher than for an ordinary gasoline car, and a series of careful tests showed it to be 80 per cent instead of 60 per cent for the latter. An interesting feature of the new car is that the motor and dynamo form a veritable electric plant which can be used to give current when the car is stopped, and this current can be used to light the premises, for instance.

Cost of Laying Dust.

The Road Protection League, which has been formed in Europe for the purpose of promoting different questions relating to the suppression of dust and the tarring of roads, recently held a meeting at Paris. M. Guglielminetti, the secretary of the league and a leading authority on such matters, made some interesting statements on the question of applying liquid matter on the roads. According to the official reports of the government engineers of the city of Paris, the Department of the Seine and other districts, the four years test of the new tarring system has given excellent results from every standpoint and quite justifies the expense. The latter is estimated at $0.03 to $0.04 per square yard. On a main avenue of the town of Melun, among others, the annual economy resulting from the tarring process has been estimated at $0.02 per square yard on the decrease of wear and at $0.01 on the watering and cleaning of the road, so that in fact the cost of the new treatment is not over what the untreated road would cost, and we have the advantage of no dust or mud. Besides the usual processes of preventing dust, a new method has been brought out by a French chemist, P. Delair, and it can also be used for laying the dust inside of houses, where coal tar cannot be employed. The experimenter had occasion to make long researches on the use of chloride of magnesium for laying dust. It can be procured at a very low price. As it is very deliquescent, when in solution it is very slow in evaporating. Thus certain bodies which are impregnated with it are able to keep moist and thus will attract the dust and small debris of all kinds, keeping them down but without sticking. It seems well adapted for floors and also for roads on this account. Although it does not suppress the powdered matter, it gives it a certain density which prevents it from rising and dispersing different kinds of germs. A strong solution applied twice in two days is enough for treating a floor. After two hours the solution sinks into the wood. Then the sweeping can be done under the best conditions. The dust when raised falls again instead of flying into the air, and can be removed easily. In Europe the price of this treatment is only $0.006 per square yard.

Germany leads to-day in the manufacture and use of alcohol for light and power. In that country potatoes are the chief source from which alcohol is produced. The potato crop last year reached the astounding proportions of 1,775,579,000 bushels, or more than 53,000,000 standard tons. Of this amount nearly one-half was used in the manufacture of alcohol and starch. One-eighth of all the tillable land in Germany is planted to potatoes, which show an average production of 217 bushels an acre, which sold at an average of 27.6 cents a bushel, or about $60 an acre. In France alcohol for manufacturing purposes is made chiefly from molasses and sugar beets.