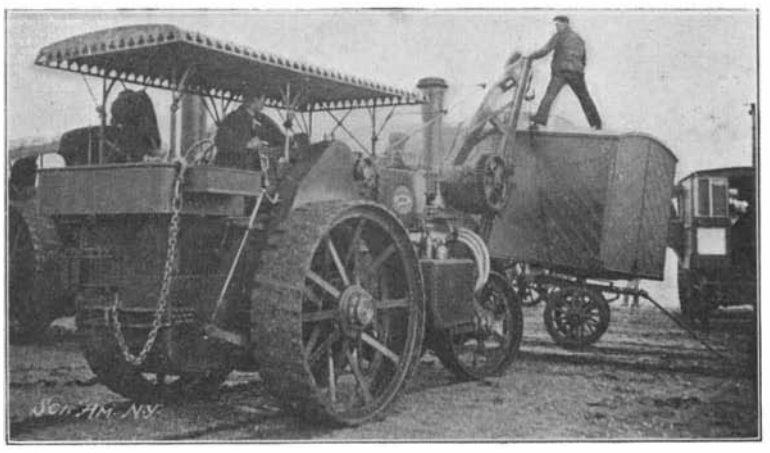
THE AUTOMOBILE IN WARFARE.

EXPERIENCES IN THE SOUTH AFRICAN CAMPAIGN.

BY HERBERT C. FYFE. LONDON.

Although traction engines have been used for military purposes at Chatham for some years past, they have not until quite recently been used by British authorities to any considerable extent in the field. In August, 1897, a trial was made in Long Valley at Aldershot, of one of the latest types of road locomotives, fitted with spring gear on both hind and front wheels, and also with the three road speeds. With this engine it was proved that stores could be taken from Aldershot to Salisbury Plain—a distance of about 60 miles—in a day; that it could easily travel at the rate of 8 miles an hour, and, when necessary to get out of the way of troops, at the rate of 12 miles an hour. At the slowest speed it dragged a gross load of 80 tons on the level, and traveled 17 miles without a fresh supply of water.



Lifting a Van.

A Wagon Built for the German Army.

This road locomotive was fitted with an independent donkey pump for filling tanks, horse troughs, or its own boiler. It was also intended to be used for driving centrifugal pumps and electric dynamos for traveling with a captive balloon.

One of the most extraordinary military parades ever seen was held on the famous Long Valley at Aldershot at the end of October, 1899, when sixteen traction engines supplied by Aveling & Porter, Ltd., Charles Burrell & Sons, Ltd., John Fowler & Co., Ltd., and J. &. H. McLaren, and between thirty and forty trucks were inspected and tested before their embarkation for South Africa. The engines were of various sizes and types, and the trucks were built to convey all possible war material, from loose grain to iron pipes. There were present to see the trials the Duke of Connaught, Prince Louis Napoleon and Prince Victor Napoleon. The Long Valley, with its great stretches of sand and rock, was admirably suited to the trials, as similar country had to be traversed in South Africa. The engines with trains of trucks were started off across country, taking hillock and ditch in their way in marvelous fashion. Some of the ditches had steep banks between two and three feet, yet these were negotiated with safety; and although the wheels sank often to the hub in wet ground at the bottom of the ditches, yet nothing stopped the engines' progress. A speed of eight miles an hour was obtained, and the display ended with a "march past."

The utility of the crane jib, which sometimes forms part of the equipment of engines of this type, was amply demonstrated. There was no difficulty in thereby removing from a train of trucks one which was supposed to be injured, Messrs. McLaren's crane engine easily lifting it out of the way. Then it was shown how readily one engine could haul another engine with its train out of a bad place by means of a steel hawser, should it stick and remain fast. The largest of the engines weighed some 15 tons, it drew from 30 to 40 tons, carried water enough for a 17-mile run without stopping, and traveled 30 to 40 miles a day. They were provided with coal trucks, and with a sleeping car for the use of the engineers in charge.

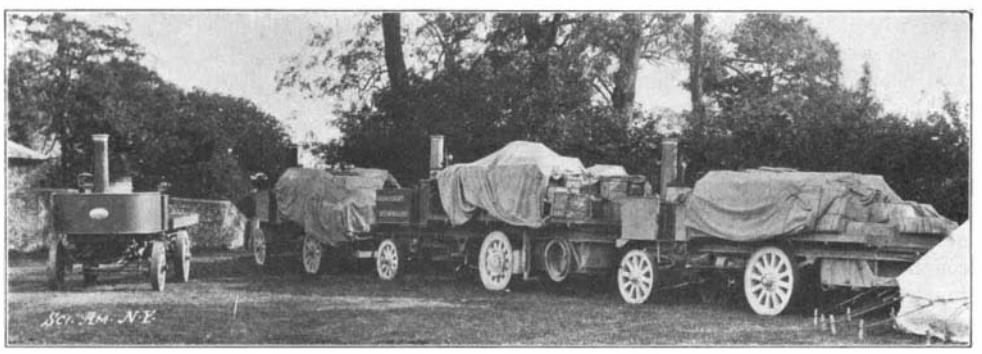
In all some thirty traction engines were shipped from Southampton for the Cape. They were intended for use for winding loads over rivers and swamps and up precipitous places. Accounts from South Africa showed how valuable they have been for these purposes. They have also been employed to pull the new "trenching plow," two of which were sent to the front. This gigantic implement cuts a furrow 30 inches deep on the solid and 30 inches wide, and this enormous work is done by putting a pulley on the plow and anchoring one end of the rope, so that the pull on the plow is doubled. Steam plows are usually used for vine and tree planting, but in Africa they were used for making shelter trenches, and also ditches along the sides of the roads. (Descriptions of these plows appear in this week's Scientific American Supplement.)

The "Traction Engine Brigade" was attached to the corps of Royal Engineers and figured in the army list as "45 Company S. Africa (Fortress) Steam Road Transport." Naturally on their arrival in Durban the engines had to be fitted together, and this took some little time, but as soon as possible they were sent up by rail to Frere and Chieveley.

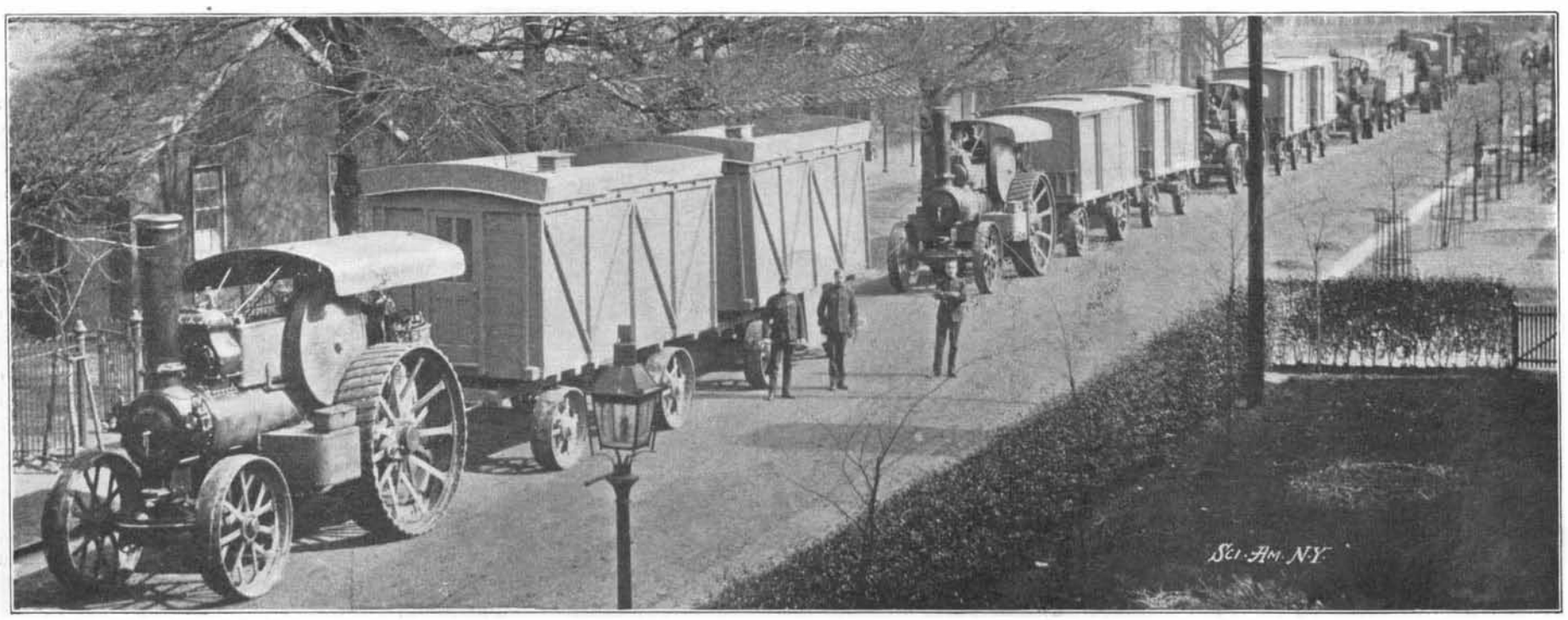
Writing from Frere Camp on January 2, 1900, Mr. Bennet Burleigh says:

"Without them the troops would require an astounding length of ox and mule wagons. The despised ox-wagon is slow and sure. Its infallible drawbacks are that it occupies a considerable length of road, requires much guarding with many attendants, and can only be depended upon to haul not more than 600 pounds. Nay, more; if the teams are to carry their own forage, the power of hauling is limited to something like 50 miles. Were the army entirely dependent upon trek ox-wagons the 1,660 of them, the inconsiderable number for conveying the munitions of the army, would stretch along several miles of road. It will be another affair if the dry weather continues, and any great use can be made of the traction engines. They require few attendants, don't gibe, and each can easily haul 12 tons. Yesterday and to-day these wheeling puffing Billies have been running to and fro, transporting stores from the railway siding to the respective brigade camp—one of which, Hart's, is two miles away. They leisurely descend into spruits, roll across and wheel up stiff, long climbs like flies walking up a wall.

Hauling a Train Over a Gully.



Thornycroft Wagons at Aldershot Maneuvers.



A Train of Transport Engines and Wagons on the Road from Aldershot to Port for Shipment to South Africa.

THE AUTOMOBILE IN WARFARE.

THE BOOKLOVERS LIBRARY

A Two-Minute Talk

The shares of THE BOOKLOVERS LIBRARY *Corporation* have had an unparalleled record. The stock is held in the United States, Canada and England by widely known literary, professional and business people. Among the library's shareholders are hundreds of names familiar to almost every cultured home. No broker, or banker, or underwriter has had a hand in the sales. The sole backing of the concern has been its enterprise, its continuous push, and its far-seeing business policy. Every dollar invested shows a hundred cents' worth of extended and established earning capacity.

The plans outlined from time to time have been carried forward in the most aggressive sort of way. We have done what we said we would do. We planned to extend the *Booklovers* to every important city of the United States; the libraries are there. We promised to include Canada; the two successful centers of Montreal and Toronto are the result; from these cities the service extends to outlying Canadian cities and towns. We made arrangements for extending the work to England; today the *Booklovers* is the talk of London; it is delivering books throughout Great Britain, and includes among its patrons scores of the most distinguished families. We promised an auxiliary library to take care of the field not occupied by the *Booklovers;* the *Tabard Inn* with its revolving book-cases and five-cent exchanges is extending the library privileges to thousands of country towns; the earnings of this one department at the present time exceed one thousand dollars a day with only one-twentieth of the field covered. This new library department was started only a year ago. In another year it will have earning capacity largely in excess even of the *Booklovers.* Last fall we announced the preparation of a monthly magazine to round out our publicity plans; today *The Booklovers Magazine* sells out its complete edition by the fifteenth of each month; it is owned independently by shareholders of the parent company, and presents all the elements of an excellent property.

We are building into the future; the whole book and publishing trade is undergoing rapid and far-reaching changes; there is a new book published in the United States every hour, day and night, and this enormous output must have its distributing machinery. Millions invested in central storehouses of granite or marble can never change the popular current. The American people want an up-to-date service in books as well as in newspapers, and they are willing to pay for it with their own cash. There is no denying the fact that the *Booklovers* is already a tremendous power among the book interests of the country; it has battled its way to the front, where it means to stay.

In connection with this public offer of a comparatively small block of *Booklovers* stock there are four inside facts which I want to make public over my own signature: 1. The *Booklovers* earnings during the three months ending February 28 were **the largest in the history of the enterprise:** 2. The operating expenses per library member were never smaller than at the present time: 3. The "used books" are wholly taken care of at good prices by auxiliary library departments: 4. The Corporation pays cash, and has no debts other than its current monthly accounts.

No additional capital is needed for the *Booklovers;* the increased capital is being used at the present time to extend the *Tabard Inn* and other departments; these auxiliary libraries are necessary to round out the best interests of the enterprise at large; they are the "by-products" of the business and they offer opportunity for very large profits.

The Corporation is capitalized for **$2,600,000** (260,000 Shares at $10 each). Of this amount **190,000 Shares** have already been subscribed and paid for at the par value of $10, making the present cash capital **$1,900,000.** There remain in the Treasury only **70,000 Shares.** Of this remaining block the Directors have authorized the Treasurer to set aside 50,000 Shares to be offered for sale on May 15th next, at $12 a Share. The remainder, consisting of **20,000 Shares,** is now offered to the public in lots of Ten Shares or more at **$10 a Share.** The terms are 10 per cent. with the application and the balance in sixty days. Stock applied for by telegraph will be held five days to await deposit and formal application. (See application form below.) The sale of this block of 20,000 Shares now at $10 and of the remaining block of 50,000 Shares on May 15th at $12 will give the Company **a completely paid-up Capital.** This announcement gives investors the last opportunity they will have of buying *Booklovers* at $10 a Share.

The **Booklovers Corporation** has paid dividends at the rate of **10 per cent.** per year since August 1, 1900. The last half-yearly dividend was paid on February 20th. The half-yearly dividend periods end June 30th and December 31st, respectively. The Corporation has no bonded debts, and its stock when fully paid is non-assessable. All Shares become dividend-bearing from the date of final payment. Dividends are payable in February and August. Applications for stock should be made out in the form prescribed below and addressed to the Treasurer.

President

1323 Walnut Street, PHILADELPHIA

Application Form for Booklovers Stock

(Use wording below in writing out your application)

(*Date*)

MR. JOHN E. BRYANT, Treasurer
1323 Walnut Street, PHILADELPHIA

Dear Sir:

Please enter my name for.....Shares of the Stock of The Booklovers Library at Ten Dollars a Share. I enclose my check for $.....being Ten Per Cent. of the par value, and I agree to pay the balance in sixty days.

Name.....

Address.....

"Tacked on to one of the big guns they should, weather permitting, shift them rapidly from place to place; nor are they quite helpless when the ground has been soaked with rain. Clip-irons are attached to the rims of the broad wheels, and these dig into the firmer soil, and the steamer rolls forward, leaving a wake like a plowed field. On the flat dry veldt the steamers trip along at a brisk eight miles an hour."

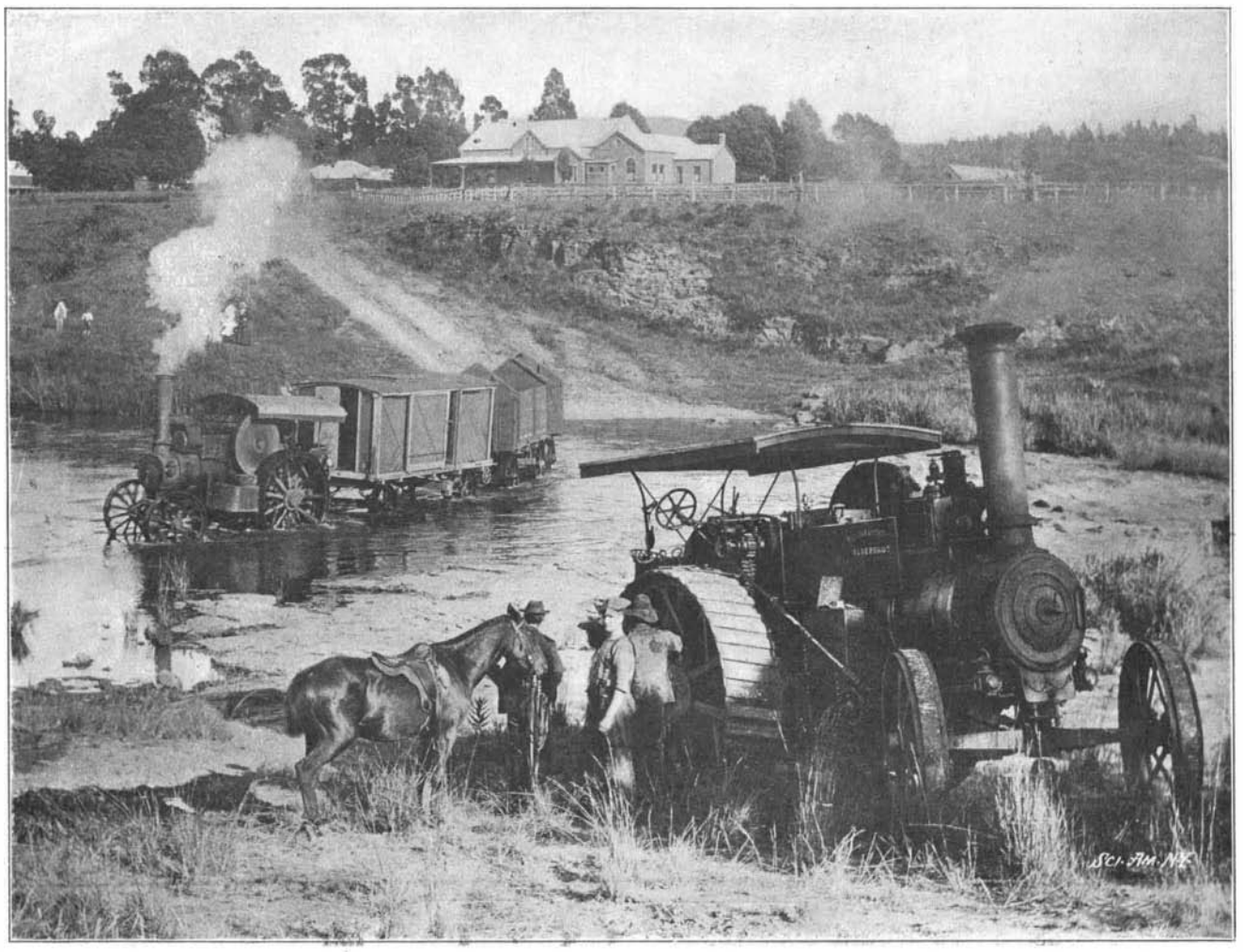
Writing later (on January 15) from Potgieter's Drift, Mr. Burleigh has another good word for the steam sappers.

Describing the crossing of Blaauwkran's Drift by Sir Charles Warren's Division, he says:

"It was a prolonged and desperate scramble to get the men and about 400 wagons and nondescript vehicles down the steep, slippery bank, through the waist-deep stream and up the sticky opposite slopes. Three ox-wagons were run down into the river and converted into bridge piers, planks being laid whereon part of the infantry were able to pass over dry shod, but the planks and footing were insecure in places, and it came to be like walking the greasy pole at Ramsgate Aquatic Sports, for numbers of Tommies went hurriedly into the water in the most diverse and eccentric manner, to the surprise of lots of people. The much-laughed-at score of Aldershot traction engines did not stick and flounder in the mud, but lumbered about, doing duty with comparative ease and considerable regularity. Their flanged grips upon the wheels gave them a sure bite of the ground, which in one or two places they churned up rather deeply.

"A by no means overloaded ox-wagon stuck in the middle of Blaauwkran's Drift close to Frere Station. Eighty oxen were tried, and were unable to move the wagon an inch. It seemed as if the whole column must wait until the vehicle was carted off. A traction engine was requisitioned to try its powers; the enormous span of cattle were taken away, and a steel hawser was passed from the engine and made fast to the disselloom. Then steam was turned on, and with snort and a hiss the steamer walked away with the wagon, conveying it some distance to a high, dry part of the roadway."

The military ox-wagon travels at a maximum speed of three miles an hour and 15 miles a day. The traction engine, while capable of hauling from 30 to 40 tons, will travel with ease 35 miles in the course of the day.



Engines Crossing a South African River.

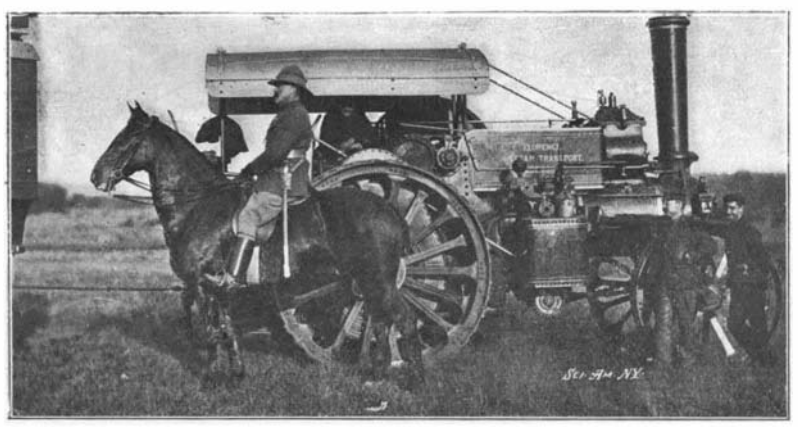
Mention may here be made of the armored road train, specially manufactured for the War Office by Messrs. John Fowler & Co., of Leeds. The engine of this train was completely armor-plated with half-inch nickel-steel plates, and the trucks designed to carry howitzers or 4.7-inch guns were also armor-plated with armor guaranteed to be Mauser bullet-proof at 100 yards. Probably all military traction engines will in the future be armor-plated.

When Col. Crompton, who commanded the corps, was organizing his equipment, he realized that it must be entirely independent of railways, and that motors must therefore be employed. Having had a good deal of experience with the steam horse while in India, he was able to design some traction engines especially suited for a campaign in South Africa. They weighed only eight tons, and consumed about 28 pounds of water an hour for every electrical horse power developed. Whenever Lord Roberts wanted to put the 6-inch guns into a position which was difficult, he always sent for the traction engines. One of Crompton's tasks was the management of a line of steam traction between Pretoria and Rustenburg. In the course of a week it would take about 130 tons of food for two columns 20 or 30 miles west of Pretoria. Thirty tons of this amount were food for men, and 100 tons were for horses and mules; and if the columns had been supplied with self-propelled vehicles, the weight could have been cut down to about seven or eight tons of fuel in place of the 100 tons of forage.

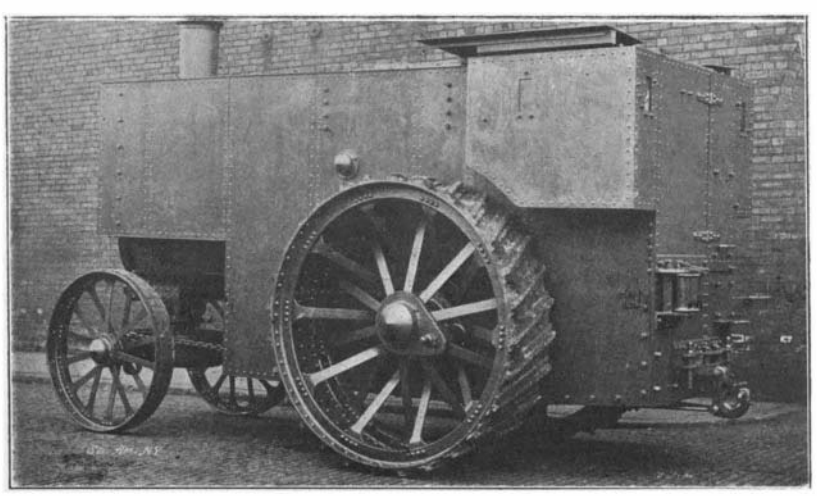
Col. Crompton says:

"On the 24th of July, a 6-inch quick-firing gun, weighing with its carriage 12½ tons, was hauled to the top of Quagga Kop, seven miles to the west of Pretoria, and 1,300 feet above it; the average slope up which the gun was hauled was 1 in 10, but there were parts of it which were steeper.

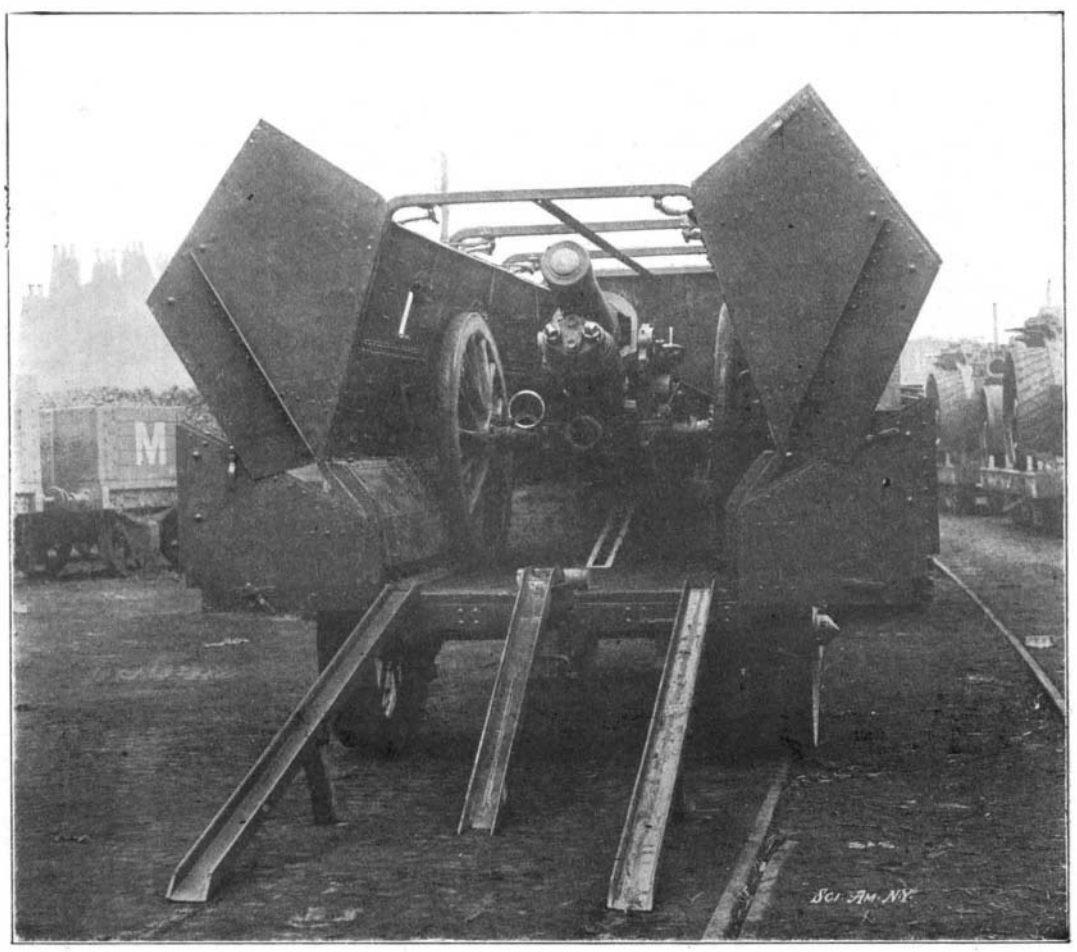
"On the 1st of August a similar gun was hauled up a slope averaging 1 in 6, and in some places more than 1 in 5, to a redoubt on the top of this hill, about five miles east of the town. A few days later two large traction engines belonging to the director of steam transport were also put under our charge, under the officers of the Electrical Engineers, and with these and the other three engines, making five traction engines, a regular daily service was organized, and stores of every character were transported to various points, chiefly to the westward of Pretoria, the longest run being to Commando Nek, 26 miles



Col. Templer at the Cape Inspecting the Engines Sent from England.



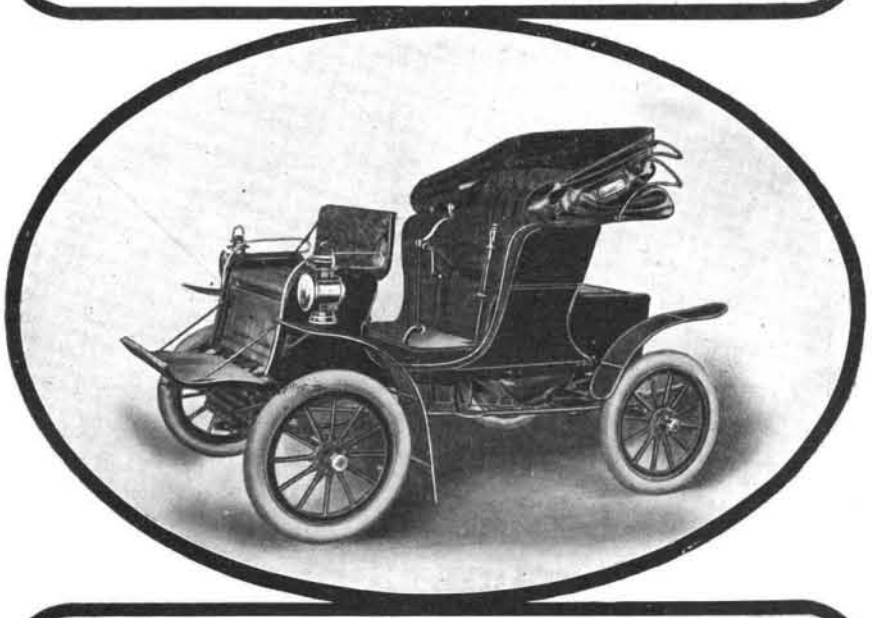
Fowler Traction Engine Sent to South Africa.



Howitzer in an Armored Wagon.

THE AUTOMOBILE IN WARFARE.

STEVENS-DURYEA



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Speed, Reliability, Hill-climbing

it has no **superior** in its class. It is equipped with a powerful seven-horse two-cylinder opposed motor of the four-cycle type, and has three speeds and reverse, all operated by the same lever. It also . . . .

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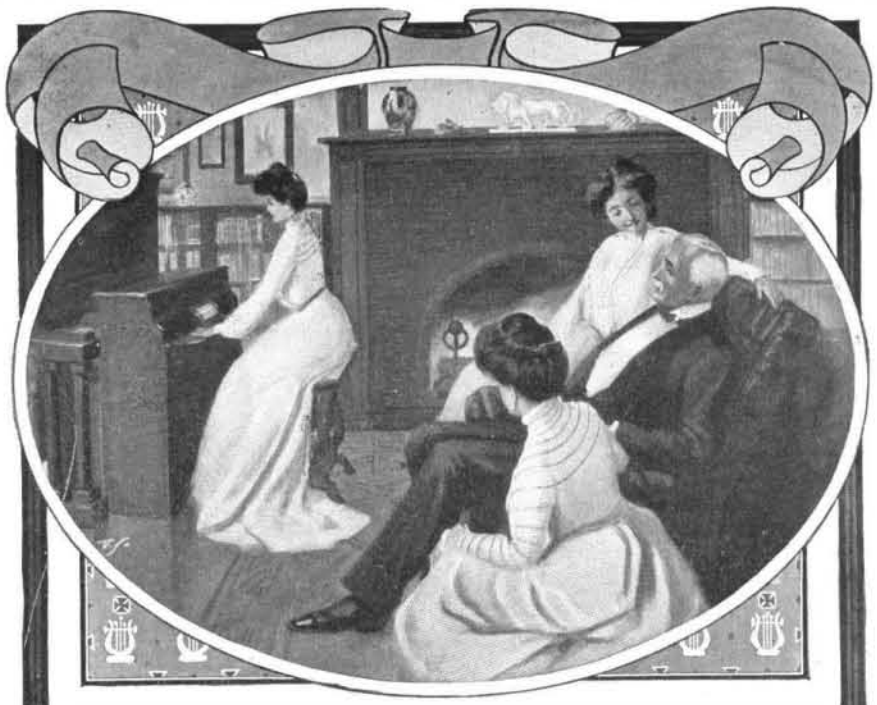

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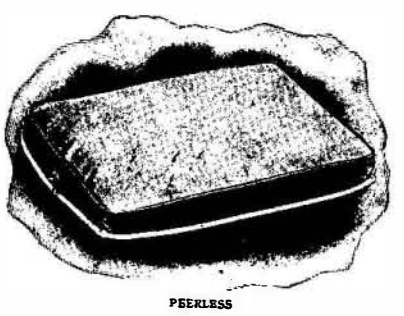

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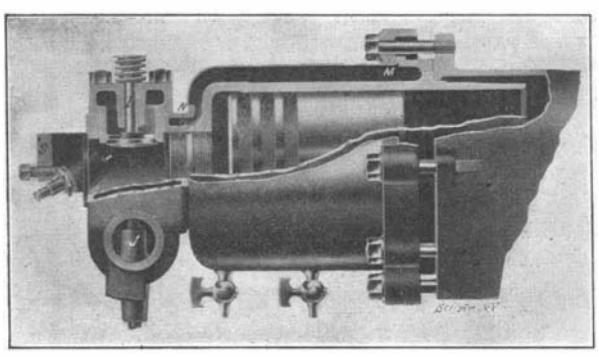
distant, where a depot was formed for flying columns. The service on this road lasted for many weeks, in fact, up to the time the corps started for England, and was carried out without any mishap or loss, although during the whole of the time the line was threatened by the Boers, and sniping frequently went on, but no one of the corps was hit. A new system of escorts was adopted; sufficient men to form two or more escorts being put under the command of the officers of the corps and encamped with the corps. The engines did twice whatever the Boers did, and twice whatever the English sailors did."

The lesson of the war as regarded automobilism was a very striking one. It was this—the whole of the Transvaal was one mass of dead animals. It was impossible to feed them. They died by hundreds of starvation. The great outbreak of enteric fever was no doubt caused by the mass of dead and dying animals. But there was not a dead or stinking traction engine in the whole of South Africa. While managing a line of steam traction from Pretoria to Rustenburg, Col. Crompton took about 130 tons of food per week for two columns 20 or 30 miles west of Pretoria. Thirty tons of that amount was food for men and 100 tons was for horses and mules. Had it been possible to supply self-propelled vehicles to the columns, the weight could have been cut to about seven or eight tons of fuel in place of the 100 tons of forage. All the heavier things, such as guns, wagons, engineers' park, etc., have been and can be transported most successfully by self-propelled machines, either steam or oil. There is a much more difficult question, and that is to do something to relieve the English cavalryman and mounted infantryman of the huge weight the horses have to carry. Col. Crompton wishes to introduce into the service some light vehicle that could accompany the cavalry and mounted infantry, and carry part of the weight which killed the horses and destroyed the mobility of the British army. He sees no difficulty in producing a 25-hundredweight engine to carry its two tons of load, to follow the mounted troops in all places where wheeled carriages could go. As an instance of what traction engines had done in South Africa, Col. Crompton stated that he had seen engines take a 10-ton gun up a gradient of 1 in 5.

THE CADILLAC GASOLINE RUNABOUT.

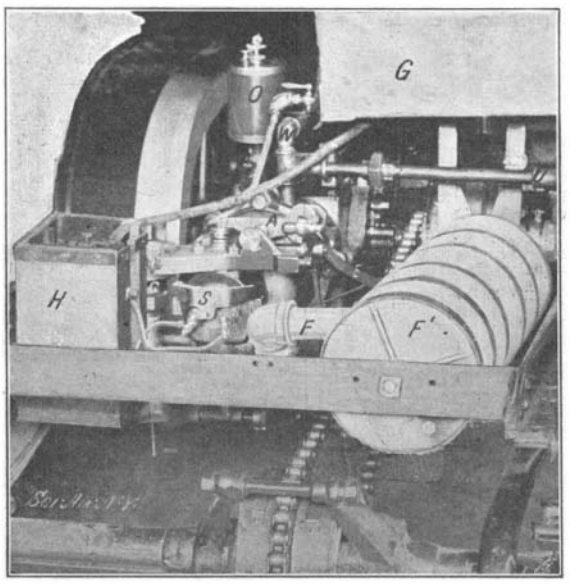
The gasoline machine illustrated on this page is a moderate-priced car recently placed on the market,



CYLINDER OF MOTOR, SHOWING METHOD OF CLAMPING ON COPPER WATER JACKET.

and having a number of original features worthy of description. All parts are made interchangeable as far as possible, and the body is entirely separate from the chassis, from which it can be quickly removed by withdrawing six bolts.

The chassis is planned after the standard pattern of American runabout. A 5 x 5-inch horizontal motor is mounted on an angle-iron frame and is connected to the rear axle by a chain. The planetary gears for the slow speed and reverse, as well as the fast speed clutch, are carried on the motor shaft outside of the



MECHANISM OF CAR VIEWED FROM THE REAR.

driving sprocket, and this shaft is made sufficiently heavy so that a third bearing on the end beyond the gears is not required. The slow-speed and reverse gears are thrown in by the usual band brakes, while the fast speed clutch of the friction disk type is operated by a long lever seen at the side of the seat.

The motor crank case and cylinder are two separate castings, bolted together as shown. A copper water jacket is clamped in place between the clamping ring and flange, *M*, on the cylinder, and flanges, *N*, on the cylinder end and the valve chamber, which is screwed tightly against the end of the cylinder on a large steel pipe nipple. The two pet cocks shown connect with the cylinder and water jacket respectively. The inlet and exhaust valves, *I* and *J*, can be seen in the valve chamber in the sectional view of the motor, as well as the method of clamping the water jacket in place. The clamp, *S*, holds in place a plate carrying two mica spark plugs. The spark jumps from one to the other, and as both are insulated, the chances of short-circuiting are small. The inlet valve is operated mechanically, and the amount it opens is controlled by an eccentric-operated rod, *E*, curved at its end to pass between a roller on the end of the valve-opening arm, *A*, and a movable roller beneath it. The end of *E* is tapered on its lower side, which slides on the movable roller, and by sliding this roller forward so as to make more of the tapered part of *E* ride upon it, the upper surface of *E* and the roller arm *A* are raised higher, thus opening the valve wider. A handle on the steering wheel controls the movement of the lower roller and hence the opening of the valve. The motor is controlled almost entirely by this ingenious throttle arrangement.

The carbureter, seen at *C*, is of the float feed, atomizer type. The needle valve button for setting the mixture projects from the carbureter top. A wire gauze cone on a suction-lifted valve that fits in the spraying nozzle, breaks up the gasoline and tends to vaporize it. Wire gauze is also placed in the opening of the air-suction pipe below the carbureter. The spark coil is located in a box, *H*, behind the carbureter. Its two secondary wires can be seen connected to the two spark plugs, as well as a heavy primary wire extending to the circuit breaker on the motor. *O* is the cylinder oil-cup; *G* the gasoline tank; and *F* the exhaust pipe leading into the muffler, *F'*.

The water is circulated through the cooling coils by a centrifugal pump. It passes from the water jacket of the motor through pipe, *U*, while pipe, *W*, connecting with the water tank, conveys water to the system to replace any that evaporates. The water in the tank is always kept cool and forms no part of the circulatory system, being used merely as an extra supply.

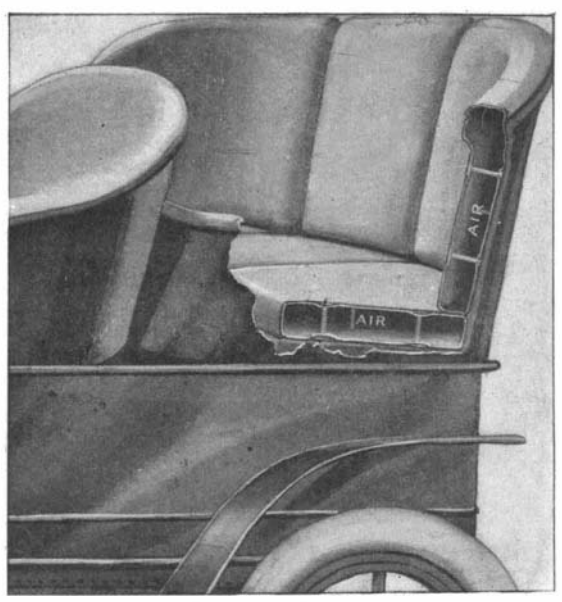
The crank shaft boxes of the motor can be slipped out and new ones put in without taking the whole engine apart. This can be accomplished very simply by removing four nuts and taking two caps off the crank case, thus enabling one to get at the boxes, which are each in two halves. The crank shaft is a one-piece forging, much larger and more substantial than is ordinarily used with the size motor employed.

The car is strongly built throughout. Ball bearings are used on the front wheels and rear axle, and the latter is strongly braced about the differential.

The tonneau body can be easily attached and fastened in place by two bolts, thus increasing the carrying capacity of the machine to four people, at a moment's notice.

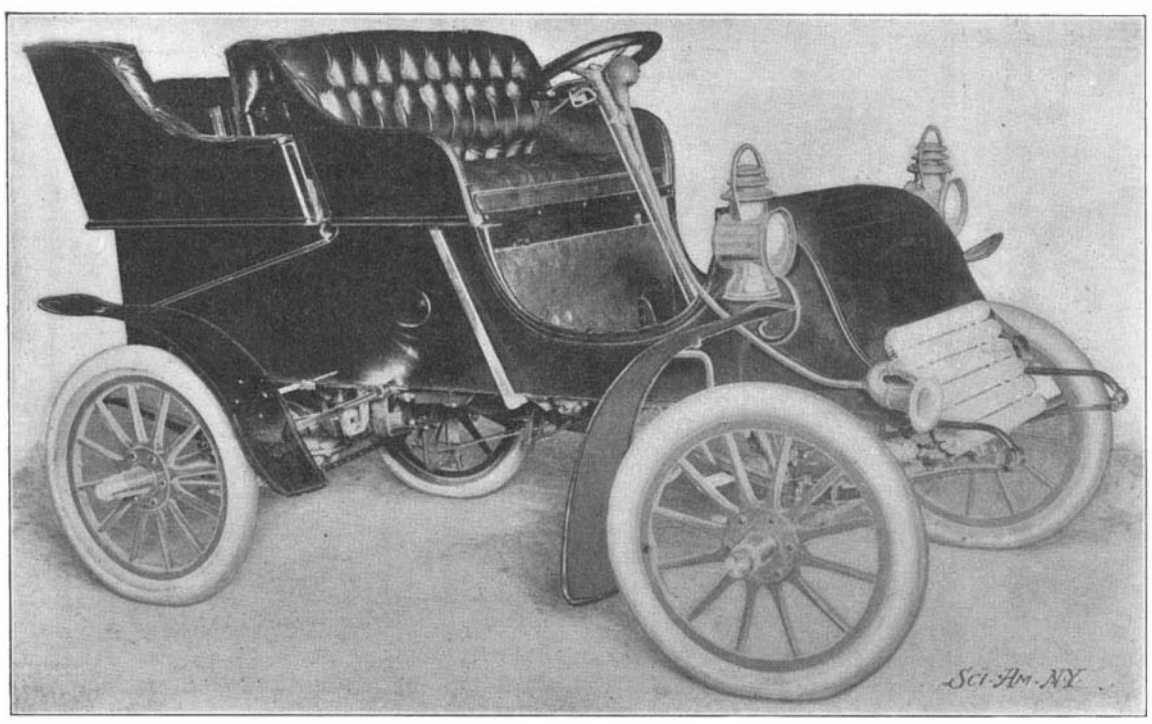
AUTOMOBILE AIR CUSHIONS.

Air cushions are now manufactured which are calculated to add as much to the comfort of the individual as pneumatic tires have to the smooth running of the machine. The cushions shown in the illustration are made of cotton duck coated with rubber sufficiently thick to make the fabric air-tight. Stays are placed on the inside at regular intervals for the purpose of holding the cushion in proper shape when inflated. The cushions have outer coverings of coru-

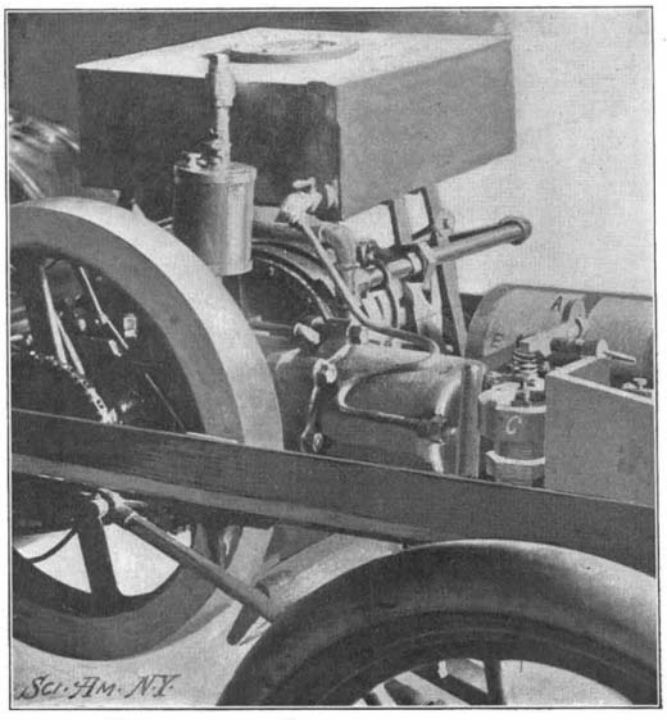


AIR CUSHION FOR AUTOMOBILES.

roy, leather, duck, etc., according to fancy. Their backs, sides, and seats are smooth and have no ridges or buttons to render them uncomfortable. Having no hollows, they do not hold the dust, and being made of rubber, are proof against dampness.



A 6 H. P. CADILLAC RUNABOUT.



ENGINE AND MECHANISM OF CADILLAC CAR.