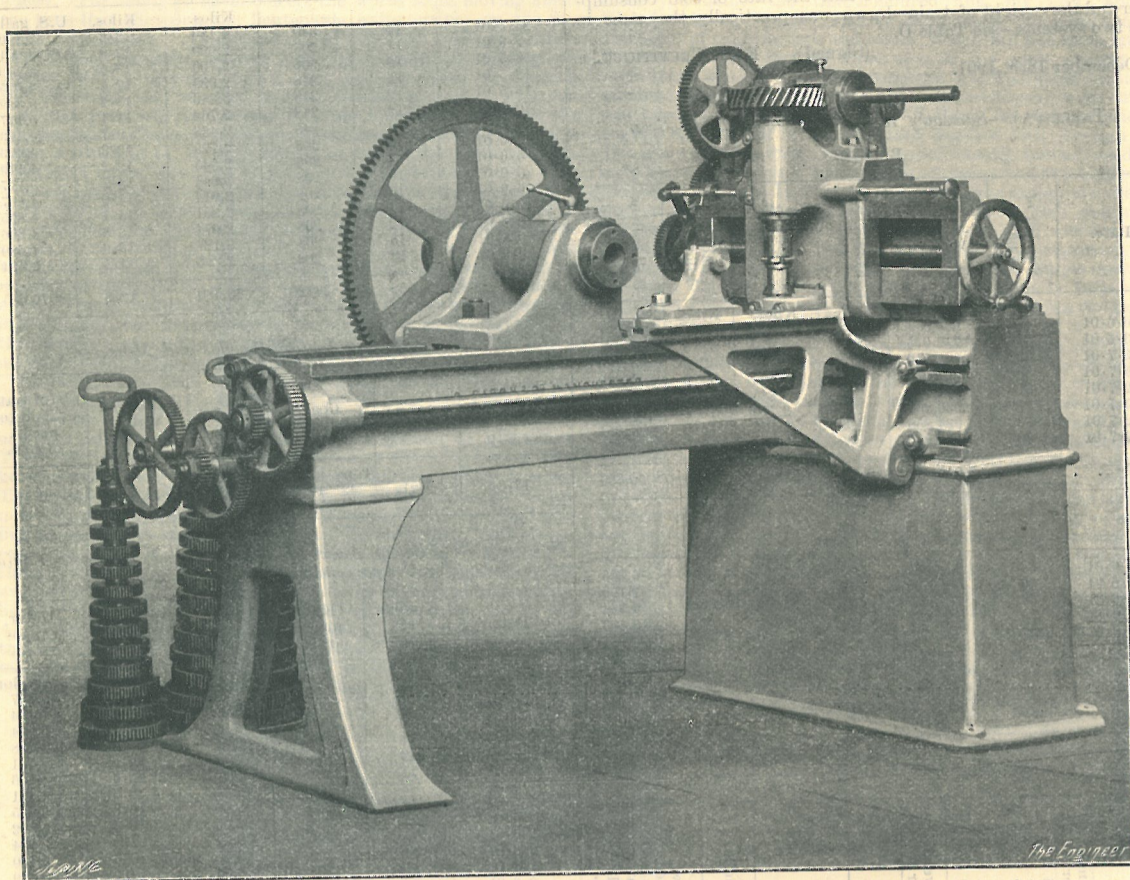


GEAR CUTTING MACHINE

G. BIRCH AND CO., MANCHESTER, ENGINEERS



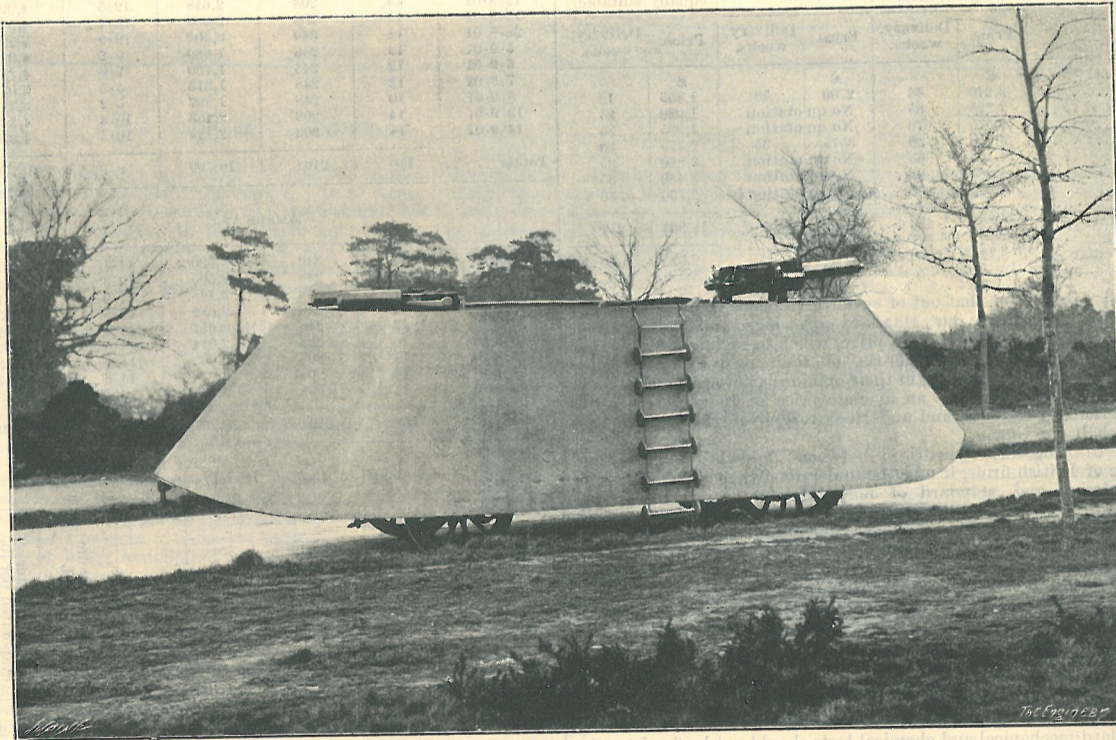
AUTOMATIC GEAR-CUTTING MACHINE.

THE accompanying illustration shows an automatic gear-cutting machine made by G. Birch and Co., Islington Tool Works, Salford, Manchester. This machine, which has been designed for cutting spur gears only, is entirely automatic in action, no attention whatever being required after the work has been set and the machine started, until the wheel is completed. The machine is made in six sizes, the smallest being capable of cutting blanks up to 2ft. diameter and 7in. wide, and the largest up to 8ft. diameter and 10in. wide. Ample power is provided for driving cutters of large size, and feeding them through the metal at a good rate of speed. The bed is mounted on two standards, the one under the cutter head being of cabinet form, and making a rigid support for the blanks and the cutter head. In some of the larger machines the two standards are both of cabinet form, and serve as convenient cupboards for tools. The head carrying the blanks is traversed along the bed by a screw, which is fitted with a micrometer, reading to one-thousandths, for setting the exact depth of tool at first cut. The dividing mechanism is positively driven by a clutch, and the dividing plate always makes one complete revolution, thus avoiding mistakes or imperfect dividing. The dividing wheel is of large diameter. The automatic arrangement can be readily set to work at any registered stroke, and is very quick in action. The worm can be dropped out of gear to allow the blank to be revolved by hand, without throwing the change wheels out of gear, thus ensuring its being returned to its correct place. A support for the outer end of the work mandril is provided, it allows the blanks to be readily changed. A stay is provided to support the rim of the blank against the pressure of the cut. The cutter head and slides are carried on an extension of the bed, the slide having large flat bearing surfaces well supported to prevent any springing under a heavy cut. The cutter, which is hollow, to take mandrils of various sizes, has long bearings of large size on both sides of the cutter, which give it great rigidity. Both bearings are adjustable for wear, and the lower one can be very easily removed when the cutters are being changed. The spindle is driven by spiral gearing, and the thrust is taken by ball bearings to give a smooth drive and prevent chattering. The spiral wheel is of large diameter, and the drive is very powerful. Six changes of cutter speed can be obtained, and means are provided for readily centering the cutters with respect to the blank, without the use of packing. Any required feed is obtainable by means of change wheels. The return of the cutter head is very rapid, and if desired can be operated by hand. As an instance of the wide range of work that can be dealt with, it may be mentioned that the 8ft. machine will cut from 4in. to 8ft. diameter. The machine illustrated is the 5ft. size.

SELF-PROPELLED WAR CAR.

THE accompanying illustration represents the latest departure in automobilism, and as will be seen, consists of the combination of offensive weapons with an armoured motor wagon, the whole forming a novel appliance, the scope and utility of which may prove of far-reaching character. The machine is the invention of Mr. F. R. Simms, and has been built to the order of Vickers, Sons and Maxim, Limited. Its principal object is to act on the defensive on the coast roads of this country, but if successful in this departure there are many other obvious uses in warfare to which the car can be applied. For instance, it is suggested that for quelling street mobs it might be adopted. It weighs complete about 5½ tons, and the 6 mm. Vickers' steel armour completely encircles the car frame. The wheels are of wood with iron tires. The armour is of crinoline shape, flattened longitudinally and having a ram fore and aft. The extreme length is 28ft., the beam 8ft., and the height 10ft. One of the chief difficulties which was

encountered in the armour-plating was the method of securing it to the frame of the car, as it was found that the constant vibration due to running over ordinary road surfaces loosened the riveting. This has, however, been remedied by attaching the armour to the frame by means of semi-elliptical springs, on to which it is hung by means of brackets. The four semi-elliptical springs are mounted on steel trestles, suitably braced and stayed to the main frame. By this it will be seen that the armour is not rigidly fixed to the frame. It is claimed, moreover, that this system of mounting increases the impenetrability of the armour, by allowing a certain amount of lateral movement when hit by projectiles. This movement is limited by distance links. The armament on the car shown at the Crystal Palace last Friday includes two automatic quick-firing Maxim guns and a pom-pom, with their



MOTOR WAR CAR

turret mountings. The ammunition is carried in boxed-in stores situated at the extreme ends of the armour.

The frame of the vehicle is rectangular, and is built up of heavy steel channels of U section—tied, stayed, and braced so as to be perfectly rigid. The motive power is supplied by a 16 horse-power four-cylinder hydro-carbon engine of the Daimler type, with Simms-Bosch magneto-electric ignition. The cylinders are 90 mm. diameter and 130 mm. stroke. The transmission of power is effected by friction cone direct through a short length of shafting to the speed-changing gear, the male part being movable, and operated by means of a foot lever throwing the engine in and out of gear. The speed gear is on the Cannstatt principle, and has four definite speeds, i.e., 1½, 3, 5, 9 miles per hour. With the accelerator, however, the speed of the car may be increased by 25 per cent. By means of the speed gear, which is controlled by two levers, each commanding two speeds, the friction clutch is automatically released before the change of speed is effected. The third lever controls the forward or backward movement, the gear being so arranged as to give all four

speeds, either forward or backward, which is attained by means of a shifting double-bevel pinion. The transmission of power to the driving wheels is by means of a counter-shaft, on which is fitted the differential gear; at either end of this shaft is fixed a sprocket wheel, and these sprocket wheels drive, by means of chains, the road wheels.

The steering gear is designed on the well-known Ackermann principle, and is controlled by hand-wheel and worm gearing, which renders the manoeuvring easy and safe for heavy vehicles of this type. Ample brake power is provided. There is one foot brake, throwing the friction cone out of gear simultaneously with acting on a powerful double-acting brake clutch, mounted on the first gear wheel shaft. There is also a very powerful hand wheel brake, putting into action, first, two powerful hand-brakes on the hubs of the two driving wheels, and, if turned still further, engaging two powerful circumferential brakes on the driving wheels.

Four persons are said to be sufficient to man the machine, but there is ample platform area for a further number of riflemen.

IRON AND STEEL INSTITUTE.

THE annual meeting of the Iron and Steel Institute will be held, by kind permission, at the Institution of Civil Engineers, Great George-street, Westminster, on Wednesday and Thursday, the 7th and 8th of May, 1902, commencing each day at 10.30 o'clock a.m. The programme of proceedings is as follows:—

Wednesday, May 7th.—10.30 a.m.: General meeting of members. The council will present their report for the year 1901. The hon. treasurer will present the statement of account for 1901. Scrutineers will be appointed for the examination of the voting papers. Election of officers and council. The Bessemer Gold Medal for 1902 will be presented to his Excellency, F. A. Krupp, of Essen. A selection of papers will be read and discussed. 7.0 p.m.: Annual dinner of the Institute in the Grand Hall of the Hotel Cecil.

Thursday, May 8th.—10.30 a.m.: General meeting of the members at the Institution of Civil Engineers. A selection of papers will be read and discussed. The following is a list of the papers that are expected to be submitted:—

1. Report by the Committee appointed to Investigate the Nomenclature of Metallurgy.
2. "On a New Vacuum Tuyere for Blast Furnaces," by Horace Allen, London.
3. "On the Microstructure of Hardened Steel," by Prof J. O. Arnold and A. McWilliam, Sheffield.
4. "On the Compression of Fuel before Coking," by J. H. Darby, Brymbo.
5. "On Gas from Wood for Use in the Manufacture of Steel," by James Douglas, L.L.D., New York.
6. "On a Combined Blast Furnace and Open-hearth Process," by P. Eyermann, Benrath, near Düsseldorf.
7. "On the Physical and Chemical Properties of Carbon in the Hearth of the Blast Furnace," by W. J. Foster, Darlaston.
8. "On the Sulphur Contents of Slags and other Metallurgical Products," by Baron H. von Jüptner, Donawitz, Austria.
9. "On the Elimination of Silicon in the Acid Open-hearth Furnace," by A. McWilliam, Sheffield, and W. H. Hatfield, Sheffield.
10. "Report on Research Work Carried Out during the Past Year," by J. A. Mathews, Ph.D., New York (Andrew Carnegie Research Scholar).

11. "On the Iron Ore of Brazil," by H. Kilburn Scott, Rio de Janeiro.
12. "On the Recovery of By-products in Coking," by J. Thiry, London.
13. "On Brinell's Researches on the Influence of Chemical Composition on the Soundness of Steel Ingots," by Axel Wahlberg, Stockholm.

The autumn meeting of the Institute will be held in Düsseldorf on September 2nd and following days.

POWER PLANT FOR SALE.—The Dublin United Tramways Company proposes to sell by private treaty the generating plant erected at the depôts, Clontarf and Ballsbridge, and which are superfluous, owing to the erection of the main generating station at Ringsend, from which is now worked the whole of the tramway system. The Clontarf station was opened in November, 1897, and the Ballsbridge station in May, 1896, and both stations were closed in January, 1900.