Dock of the River Tyne Improvement Commissioners, where there is a clear course of about three-quarters of a mile, a clear width of about 100 feet and a depth varying from 20 feet to 30 feet. The experiments commenced early in April, 1904, and extended over a considerable period. They were conducted under the charge of one of Messrs. Swan, Hunter, & Wigham Richardson's staff, with an electrician to attend to the motors and gear and another man to steer. The following were investigated, and the results obtained incorporated in the design of the ship and propellers, and communicated to the Cunard Steamship Company as the experiments progressed:—(1) Turning and manoeuvring trials; (2) wind resistance; (3) wake when propellers were running; (4) skin friction; (5) wave formation; (6) limits of error due to wind and effect of fouling ship's bottom; (7) apparent slip; (8) rudder efficiency; (9) time and speed in turning; (10) stopping and reversing; (11) turning by screws; (12) tactical manoeuvres as an armed cruiser; (13) most efficient position of propellers; (14) effect on speed of "choppy" seas; (15) effect of cutting away deadwood; and, lastly, the effect on propelling efficiency of the use of boss cones and sleeves of shell bossing.

During the time these investigations were being made, the foundation for the vessel was being built. An area of 650 feet long by 35 feet wide was driven with piles, five to a row, the rows being four feet apart. These piles were of pitch pine about 35 feet long, and were driven by a two ton hammer. On these piles was built a solid deck of six inch planking. This deck reached the ground level, and upon it the keel blocks were laid. On account of the large size of the "Muretania," and the severe stresses which will come on the upper works in tension, silicon steel has been adopted for the shell doublings and doublings on two of the decks. To save weight, high tensile steel was adopted for the plating of the various watertight bulkheads. The silicon steel had an ultimate tensile strength at least 20 per cent. greater than the ordinary quality of mild steel, and, therefore, where silicon steel was employed, a reduction was made of about 10 per cent. from the scantlings fixed for mild steel. Not only was a considerable saving in weight effected by this, but better riveting was made possible owing to the finer plates and smaller rivets used. The main frames and beams placed end to end would extend over 30 miles, whilst the largest shell plate weighed from 4 to 5 tons, and the total number of plates which have been used has exceeded 26,000.

In a paper read before the Newcastle-on-Tyne Association, Mr. E. W. De Russet, stated that no less than 54,000 drawings were made for the various persons interested in the building of the vessel.

MODERN AMATEUR MACHINE SHOPS.

By W. L. McLaren.

II.

In a Northern city there lives a young man aged twenty-one, who when he was ten years old used one of the springs of the baby carriage, which he himself had ridden in, to make a hand-power magneto capable of giving a shock that would make a strong man jump. At the present day he has an outfit of small motors, generators, gas and steam engines, guns and pistols large enough to stock a curiosity shop; most of them made by himself.

The shop contains a small foot power bench lathe, fitted for screw cutting and indexed for milling with a small home-made milling attachment, which for simplicity and general effectiveness might give pointers to some of the people in that line of manufacture. The shop is situated in the cellar of his fathers residence and besides the lathe contains a bench and vice and small Salamander boiler which furnishes steam to an engine of 1½-in. bore by 2-in. stroke, which alternately drives either a small electric generator and emery wheel (the emery wheel is upon occasion replaced by a saw when there is any wood-work to be done). Fig. 1 shows the boiler and engine, the latter being belted to the dynamo. The engine is of the Crocker Wheeler type, rated at 1-6 horse-power, and operates a 250 volt generator at 1,700 revolutions per minute, the engine running at 550 revolutions per minute. The boiler carries a pressure of 110 pounds.

Fig. 2 shows a 25 volt 1-16 horse-power Edison type generator with self-aligning bearings, built five years ago, this machine has to run from 3,000 to 4,000 r.p.m. to give the above stated horse-power.

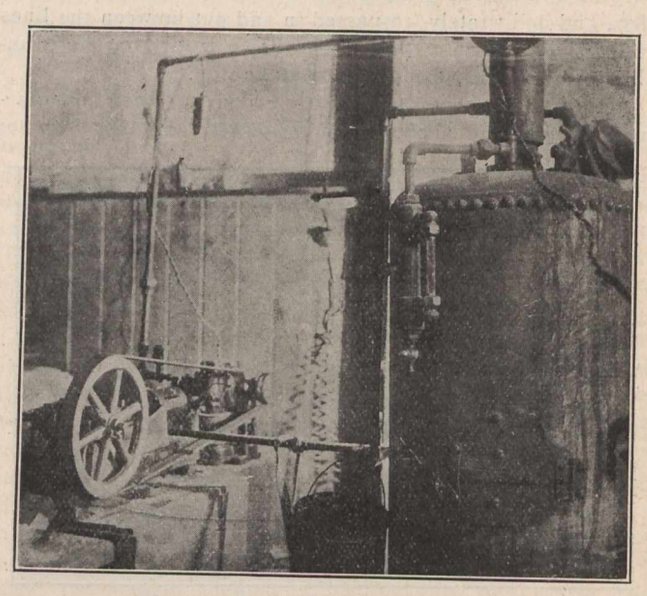

Fig. 1.—Small Engine and Boiler.

Fig. 3 shows a bullet-sizer and lubricator designed and built very recently, as far as I know there is no such useful article on the market. It is a very simple affair, the bullet being placed in position is forced down by the lever to a mark or stop, then the handle of the grease cup is given a sharp twist which forces the lubricant into the grooves, the lever is then made to finish its stroke, dropping the bullet out ready for the shell. Different sets of dies are, of course, used for different calibres.

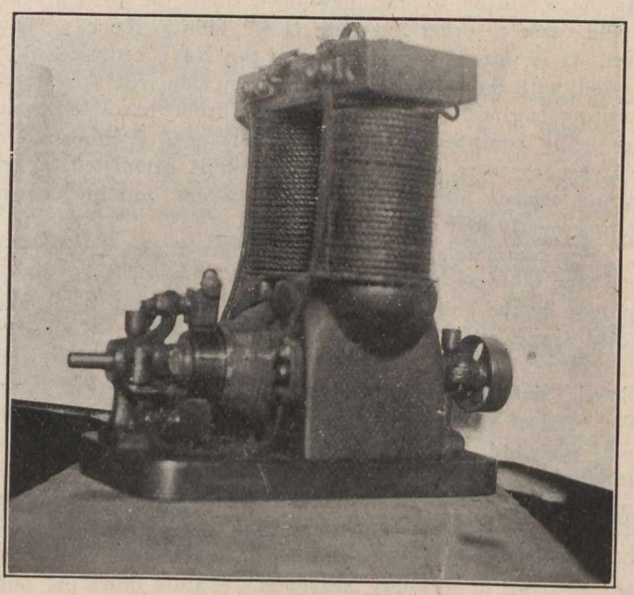

Fig. 2.—1/16 Horse-power Generator.

The most recent product of the little shop, is nothing less than a 22 calibre automatic pistol, the magazine of which holds ten cartridges, every part of the arm was made and machined on the premises, even to the rifling of the barrel, which is four inches long, having five lands, one turn in 14 inches. The whole automatic mechanism is contained in the breach bolt, there being two springs, one for the striker and one for returning the bolt after the discharged shell is thrown out. The barrel being practically solid with the frame (it is screwed in tight, 18 threads to the