I ......

## STEAM-REVERSING ENGINE.

We illustrate a steam and hydraulic starting and reversing engine manufactured by Messrs. W. H. Allen, & Co. of York street Works, Lambeth, and of which Messrs. Allen and Mr W.L. Williams are the patentees. This is one of the largest that has ever been made for marine work, and demonstrates to what enormous proportions marine engines have arrived, the starting engine having a cylinder 324 in. in diameter by 424 in stroke. The principal feature of this engine is the automatic gear for controling the lever. By its aid the links of the main engines follow exactly the motion of the starting lever. If this be put completely over, the links will go into full gear, either forward or back-ward as the case may be, while if the lever be fixed at any intermediate points the links will take up a corresponding position. The means by which this is accomplished will be understood on reference to the engravings. The starting lever is pivoted at its end to the framing, and is connected by a short link to an arm or crank on a small weigh-shaft which at its opposite extremity carries an arm which works the valve of the steam cylinder. The first crank is not connected directly to the shaft, but conveys its motion to it through a train of spur gear, consisting of four wheels. Two of these are on the weigh shaft, and two are on a stud on a lever centred on the shaft. Calling these wheels respectively Nos. 1, 2, 3, and 4. No 1 is fixed to the arm and is loose on the shaft; it gears with No.2 which together with No. 3 to which it is fast runs loose on the stud in the lever; No. 3 gears with No. 4 which is keyed to the weigh shaft, Nos.1 and 3 are the same size, and likewise Nos. 2 and 4. When the man puts the lever over a certain distance the motion is communicated through the train of wheels to the weigh-shaft and thence to the steam valve. Immediately the steam piston commence to move its motion is communicated (Fig. 2) to the lever which carries the wheels. No. 2 wheel is in gear with No. 1 which being fixed to the starting lever is incapable of motion; the former therefore, rolls over it, rotating on its axis, and carrying No. 3 wheel with it. No. 3 causes No. 4 to rotate, and in this manner the weigh-shaft is moved in such v direction and such a speed that the steam is cut off when the links have travelled the required distance. The starting engine is locked at that point by the hydraulic cylinder above, the valve of which is connected to the steam valve. For reversing the engines when the steam is down, an hydraulic hand pump is fitted on the hydraulic cylinder and being connected with upper and lower part of the hydraulic cylinder, enables a man in charge to reverse the engine by hand power.

One of the great difficulties that have always existed in starting engines has been leakage of water from the hydraulic cylinder, this is overcome by the atachment of a small accumulator which is seen on the right hand side of the hand pump and consists of a leather piston kept down by a powerfull-spring, by means of which the pressure is maintained in the hydraulic cylinder and any leakage is made good immediately. Messrs. W. H. Allen & Co. have supplied a large number

of these starting engines to the principal steamers aflost, the one illustrated above being for the steamship, " Ireland, " which has been built by Messrs. Laird Brothers, of Birken head, and is the largest paddle steamer in the world

These starting engines are not confined to marine work, as they have been supplied for steel rolling mills and steel works generally-Eng.

## THE ELECTRIC LIGHT FOR WAR SHIPS.

The Italian cruiser "Giovanni Bausan, built and armed by Sir W. E. Armstrong, Mitchell & Co., Newcastle-on-Tyne, and commanded by H. R. H. the Duke of Genoa, left the Tyne on her official speed trial on the 11th May, and during a pro-longed trip of over six hours' duration, maintained the exceedingly high mean speed of considerably over 171 knots per hour.

The vessel which, with her powerful armament of Armstrong guns and torpedoes, is probably the most redoubtable cruiser in existence, is fitted throughout with the electric light.

Two gramme dynamos driven direct by Brotherhood 3. cylinder engines, supply the required current, and together with 32 1-horse power secondary batteries, manufactured ex-pressly for ships' use by the Electrical Power Storage Company and enclosed in teak boxes instead of the usual glass cells, are placed in the after torpedo chamber, where are also fitted an ammetre, a voltmetre, and a switch-board controlling the connections between the dynamos and accumulators and also the nine distinct circuits into which the electric lamps are divided. The incandescent light circuits, seven in number, are as follows :

		ps.
A.	Passages, deck-houses and captain's cabin	44
B.	Cabins and mess-rooms	45
C.	Coal bunkers	19
D.	Engine room	21
E.	Stoke holds, fan rooms, and hydraulic engine room	29
F.	Torpedo room	7
G.	Magazines and steering gear	1i
	· · · · · · · · · · · · · · · · · · ·	

making up a total of 176 lamps, all of which are of the E lison 8-C. P. 51 volt pattern.

In addition to the division of these lamps into seven circuits at the switch-board, all the cabin lamps are fitted with individual switches.

The ship is also fitted with two search arc lights, of 20,000 C. P., placed on the forward and after gun loading stations respectively.

The ordinary practice on board is to start the dynamos to charge the accumulators during the afternoon, keeping them running during the evening until the cabin circuit is switched off, when the dynamos are stopped, and the accumulators serve to maintain the passage lamps throughout the night.

The accumulators are also employed to maintain a portion of the incandescent lamps when the dynamos are feeding the search lights, and are, moreover, a very useful reserve in case of it being necessary for any reason to stop the engines, or when only one or two lamps are required for any special purpose

The leads are arranged on the double wire system and are throughout enclosed in wood casing. The entire fitting up of the installation has been performed

by the builders .- Electrical Review.

## A NEW PROCESS FOR TOUGHENING STEEL.

The French Société d'Encouragement have had under prolonged examination a process, invented by M. Clemandot, for working steel. The process is described by the *Revue Imdust*. relle as consisting in heating the metal until it acquires a sufficient ductility, and then subjecting it to a high pressure during cooling. In this way a modification of the structure of the metal is produced, and the material acquires properties analogous to those developed, by tempering. Similar processes have been tried in France, but only upon the same principle that is to say, by operating upon the metal while yet in a state of fusion. M. Clemandot, on the contrary, takes steel already made, heats it simply to a cherry red, and submits it, by means of a hydraulic press, to pressures of from 1,000 to 3,000 kilos. per square centimeter. After having allowed the steel to cool between the two plates of the press, it is withdrawn with all its new qualities perfectly developed, and does not require any further treatment. The result of the process is to impart to the steel a fineness of grain, a degree of hardness, and a notable accession of strength to withstand rupture. This alteration is most considerable with highly carbonated steel, and in this respect the metal is made to resemble tempered steel, without being in all points identical with it. The cause of the alteration in physical condition is ascribed to the rapid heating and no less rapid cooling of the metal. When the red hot steel is first strongly compressed, to conversion of the mechanical energy into heat serves to raise the temperature of the entire mass, at the same time that the particles of the metal are more closely cemented together. This effect is followed by a rapid cooling, due to the contact of the plates of the hydraulic press with the surfaces of the metal. The close pressure materially increases this conducting effect of the cold metal.

A stag has been recently completed for a lead smelting works at Pueblo, Cal., which is 319 feet in heigh and 10 feet in diame. ter in the clear from the foundation up. It rest on 16 feet of smelter slag, which was poured in a liquid state in the ground 16 feet deep, and allowed to cool and solidify. On top of this, and above ground, is a second foundation, 16 feet high, made of brick. The stack proper, which is 287 feet high, is made of iron and lined with fire-brick. It is the largest stack west of the Missouri River, and when completed was painted red.