MACHINE FOR CARVING WOOD MOLDINGS.

THE process usually employed for the manufacture of plain wood moldings is quite simple, because the latter possess a continuous and uniform profile, which is obtained by means of a molding-plane, the depressions and reliefs of the blade of which correspond to those of the profile that it is desired to produce. But, up to the present, in order to manufacture complicated moldings of a non-continuous profile, it has been necessary to secure to a backing of wood various ornaments molded in a plastic material, and which have an unfortunate tendency to become detached from their support. This process has the disadvantage of being slow, tedious and expensive.

In order to obviate such inconveniences, M. Marbut, a French inventor, has devised a machine by means of which moldings of a multitude of patterns of the most complex character may be turned out at the rate of 16 running feet per minute, in the case of wide ones, or of 40 in that of narrow ones. The invention is based essentially upon the fact that it is possible to carve reliefs with surfaces that are curved or are oblique or perpendicular with respect to each other, by the meeting of planes produced by the action of chisels or gouges of proper form and having variable inclinations. If we consider as the raw material of the molding a strip of wood or a molding presenting an ordinary profile, it will suffice to distribute the attacks of the chisels or gouges in two series—those perpendicular to the strip of wood and those parallel with it and entering it edgewise. The meeting of the sections thus made in the wood will cause the detachment therefrom of small pieces in the form of parallelepipeds, which will leave the desired reliefs upon the strip. Let us note that the result is facilitated by the fact that it is possible to work upon a strip of wood that has already been molded longitudinally. In order that this explanation may be understood, it will be well for the reader to glance at the type of molding figured in the cartouche accompanying the engraving that illustrates this article, and in which will be seen also the general and longitudinal profile of the molding that is afterward carved by the Marbut machine.

MACHINE FOR CARVING WOOD MOLDINGS.

A close examination of this figure will permit it to be understood that the forming of the inverted circumflex accent, so to speak, that decorates the top of the molding may be effected by the meeting of the sections made by an angle gouge working vertically and two gouges entering the wood obliquely. The part immediately beneath is carved by an angle gouge entering the wood vertically, and then by another and slightly analogous one working parallel with the surface of the strip of wood. These actions of the chisels take place of course in several successive operations; and, moreover, it is necessary that the form and depth of entrance of the various tools shall be minutely studied in order to have them produce the desired chiseled *motif*. It requires quite a large number of tools to obtain the desired relief, but the latter is given with great precision by the automatic machine in which they are used after it has once been regulated.

Without entering into minute details, we shall have a few words to say as to the operation of the apparatus, a photograph of which is reproduced in the accompanying engraving. The two large wheels seen to the right and left serve to carry along the strip of wood, which rests upon an endless steel belt actuated by the wheels. Owing to a control by worm gearing, of which the thread is now and then horizontal, the motion is intermittent, and the stoppages permit the wood to undergo the successive actions of chisels and gouges mounted upon the vertical or horizontal tool-carriers seen in the engraving. In reality, it is possible to cause five groups of chisels or gouges to act upon the strip of wood and to make them enter the latter obliquely in order to obtain the most varied combinations of several intersecting planes. It is possible for certain of the tools, moreover, to carve the wood from beneath. Finally, let us add that there are two tool-carriers arranged for giving a rotary motion to the tools, so as still further to increase the number of ornamentations that the machine is capable of producing. We shall not dwell upon the mechanical control of the motions, which is effected through the

intermedium of cranks actuated by a longitudinal shaft with the interposition of telescopic arrangements which facilitate the putting in place and regulating of the cutting tools, and, at the same time, render it possible to work strips of wood of variable thickness. —Translated from *La Nature* for the SCIENTIFIC AMERICAN SUPPLEMENT.

MARINE ENGINES.

KEROSENE VS. GASOLINE.

By A. E. POTTER.

THERE is no denying the fact that, unless thorough precautions are taken, there is a considerable element of risk attending the use of gasoline, especially when employed for marine propulsion; that the risk is by no means imaginary is proved by the fatal accidents that too frequently occur. The risks, to be sure, may be almost entirely removed, provided the installation is intelligently and properly made, no leaks are permitted, and a careful, competent person is in charge. Still the danger is recognized, and vast amounts of money have been expended in trying to overcome the natural objection to its use. In engines using gasoline vapor under pressure generated with heat, obviously the danger is decidedly greater than in engines of the explosive type. In the alcohol-vapor and similar engines, not using gasoline at all, these objections have been, of course, practically removed.

In explosive engines there are fundamental principles involved, which either are not fully understood by designers and constructors, or which they have been unable to master, in this type of engine, especially if designed for the use of kerosene.

The kerosene engine of to-day is an evolution from the ordinary explosive gas or gasoline engine. The wide range of the explosive proportions of air and gasoline vapor is in a measure responsible for the fact that many poorly-designed and more poorly-constructed engines are able to run at all. With kerosene, the proportions of the mixture must of necessity be very much more exact.

The ignition is a simple matter in gasoline as com-

there, and force it into the explosion chamber. This gives him a better mixture than the kerosene engine manufacturer can get, as kerosene used in this way would not be held suspended by the air in sufficient quantities to become explosive, and it would accumulate in the crank-case.

There is a method, however, by which it is possible to get a perfect mixture of kerosene vapor and air in proper proportions, vary it at will, handle it, throttle it, and explode it just as one would a gasoline mixture. It does not involve much complication or greatly increased cost. In, for instance, a 6-inch by 6-inch single-cylinder two-cycle engine, with exhaust port opening at 75 per cent of the stroke and inlet port opening at say 85 per cent, it is rarely possible, with no leaks, to get a compression of more than four pounds to the square inch. This would prove that the clearance must be 3.23 times 85 per cent of the piston displacement (144 cubic inches), which would be 529 cubic inches.

Inversely, given a clearance of 529 cubic inches and a displacement of 144 cubic inches, with inlet valve closed, there would be a vacuum equal to 8 inches of mercury. Allowing for loss by wire-drawing, or friction of incoming air, in operation this vacuum will frequently exceed a maximum of 4 inches of mercury at the expense of the volume of the charge of gas drawn into the crank-case, as noticed when the vacuum gage has been connected to the crank-case with suitable swing check valve.

Supposing the clearance were to be equal to the displacement of the piston, 144 cubic inches, the compression would equal 14.7 pounds, while the vacuum would be something like 15 inches of mercury, sufficient to thoroughly vaporize the kerosene. If this primary compression chamber is higher than the vaporizing device, and all surplus kerosene can drain back to the vaporizer, instead of collecting in some low place, the finely-divided or vaporized kerosene will pass from the compressing chamber into the firing chamber, where it can be exploded by means of an electric spark, as the mixture would be uniform. Heated air would also tend to assist proper vaporization, and as there is always a surplus of heat in the exhaust, hot air is always available.

SELF-IGNITING DEVICES FOR COAL-GAS.

M. A. LECOMTE recently read a paper before the French Société Technique du Gaz, upon Canioni's self-igniting arrangements for coal-gas. Canioni still employs platinum as the active metal, for although several other metals are available for the same purpose they all have defects of their own. Palladium is the most active of the metals capable of rising to a high temperature when exposed to a stream of raw gas and air, but it volatilizes at 1,500 degs. C. Iridium is more refractory than platinum, but it is also less efficient; and in time it volatilizes from the hottest part of a non-luminous gas flame. Platinum is therefore still the best substance to use, provided a sufficient quantity is taken, and distributed on a properly porous support. Canioni prepares his active pills by precipitating a solution of an aluminium salt so that the aluminium hydroxide (hydrated alumina) falls in a gelatinous condition; he then pours off the liquid, dries the residue, and forms it into the desired cylindrical shape in agate molds. The pills are next heated in a powerful furnace till all the water is driven off, and before they have had an opportunity of becoming damp they are put into a 10 per cent solution of platinum chloride in alcohol, remaining there for about a fortnight till they have absorbed the predetermined quantity of metal. Finally, they are ignited in a gas flame. Such igniters retain their activity even after exposure in a gas flame, day and night, for ten months; and even if kept for three hours in air artificially saturated with moisture, only become less rapid in firing a current of gas. If they are constantly exposed to a leak of gas their pores may become choked, but they are rendered active again by blowing upon them. After a twenty-three hours' rest these igniters fire coal gas in from four to fifteen seconds' time. In Canioni's lighter for incandescent burners the apparatus is carried on an elbow from the base of the burner proper, and comprises three upright extensions, bearing the pill, the jet of a pilot-flame, and an iron-jacketed tube containing mercury respectively. The orifice leading to the main burner is normally closed by a weighted valve operated by a lever lying in the elbow. When the gas is turned on it cannot pass to the burner proper, and is therefore diverted to the jet below the igniter and to the pilot flame. The igniter then glows and fires the pilot; the heat from the latter expands the mercury in the glass tube (which is closed at the top), forces the liquid downward, and causes a small india rubber bag to be distended. The expansion of this bag depresses the lever aforesaid, opening the gasway to the large burner, and simultaneously cutting off the supply to the igniter and the pilot. When the burner is put out the mercury contracts again, the rubber bag shrinks, and leaves the whole arrangement as it was at first.

AMERICAN RAILWAY EQUIPMENT.

On June 30, 1902, there were 41,228 locomotives in the service of the railways, which was 1,644 more than were in use in 1901. Of the total number of locomotives, 10,318 are classed as passenger locomotives, 23,594 as freight locomotives, 6,683 as switching locomotives, the remainder, 633, not being classified.

The total number of cars of all classes in the service of the railways on the same date was 1,640,220, there having been an increase of 89,387 in rolling stock of this class. Of the total number of cars, 36,991 are assigned to the passenger service, 1,546,132 to the freight service, 57,097 to the direct service of the railways. The foregoing figures do not include cars owned by private companies and firms that are used by railways, as no returns for them are made to the Interstate Commission.

The report of the Commission contains the usual summaries to indicate the density of equipment and the extent of its use. They show that the railways