in the cesspool, as they are always, in such media, of ammoniacal and reductive nature. These reactions show that it is useless to employ sulphate of iron, sulphate of copper, etc., for although in the beginning these metallic salts might have some effect, they would subsequently become changed by fermentative influences and lose their efficacy. The first trials made showed that ordinary soda, mixed with ordinary chloride of zinc (in the proportion of 5 kilogrammes of each to every cubic meter of matter), was quite sufficient to kill the larvæ and prevent the hatching of further eggs laid in the same place during the season. This process could, if necessary, be used for stationary, hermetically closed cesspools, but it would not do for movable closets, sewage tanks, or open drains. Petroleum was then tried by the author of the pamphlet in question, in the proportion of one liter to every superficial meter; but in a short space of time—due probably to the slight rise in temperature caused by fermentative processes—the petroleum disappeared. This was verified by putting a stick into the cesspool; if petroleum had still been present, it would have left traces thereon. Coal tar was then tried with much better results, although they were still not all that could be desired. The most satisfactory results were secured with raw petroleum or raw schist oil (residue of distillation). Two liters per superficial meter were mixed with water, the whole being well stirred up with a piece of wood. This, on being poured into a drain or closet, will form a stratum of oil which will destroy all the larvæ, while, even should flies not be prevented from entering the drain, at least all the eggs they may deposit will be prevented from hatching. This oil is sufficiently consistent and tenacious to adhere to the walls of drains, to form a coating over solids, and remain attached thereto for a long time. This protective layer of oil also facilitates the development of anærobic bacteria which cause the rapid liquefaction of solids, thus rendering them quite unsuitable as a breeding ground for Diptera. In the case of manure heaps this oil may be mixed with earth, lime, and fossil phosphates, in which state it is sprinkled (preferably in the spring) over all sources likely to tempt young couples of the Diptera family to start housekeeping and the rearing of a family.

Electric Trains for the Simplon.

It was at first proposed to use steam trains in the Simplon tunnel, but afterward the electric system was decided upon on account of the high heat of the tunnel coming from the hot springs and again because it was difficult to ventilate the tunnel and carry off the smoke. The administration of the Swiss railroads has lately accepted the project of the Brown-Boveri electric firm for installing the system of dynamos and rolling stock. The traction will be carried out according to the system which is now in use on the Valtelline road in Italy. The hydraulic power of the Videria and the Rhone which already served for putting through the tunnel, will operate a turbine station and the latter will supply current to a number of sub-stations situated some 30 miles off. In these the high-tension alternating current will be converted to 2,300-volt current for the different circuits. A dam is now building which will be nearly 500 feet long. The head of water is some 30 feet. The main station contains two halls for the turbines, 120 feet long, and the dynamo hall lies between the two. Each of the turbine halls contains four pairs of horizontal turbines. Each unit is laid out for 3,000 horse-power at a speed of 200 revolutions per minute. The turbine shafts pass through the wall and in the dynamo room they have the alternators mounted on them. These dynamos have a capacity of 1,500 kilowatts and generate three-phase current at 25 cycles. Lombard governors keep the speed constant. The three-phase current passes to the transformer hall, where a bank of oil transformers raise the tension to 33,000 volts. For the traffic in the Simplon tunnel it is intended to use five electric locomotives at first, and the electric system is to be extended to all the sections of the Simplon road which are operated by the Swiss railroads, or a total length of 25 miles. The total cost of the electric equipment of the tunnel is estimated at $200,000. It is expected to open the new line about the 1st of May.

The Current Supplement.

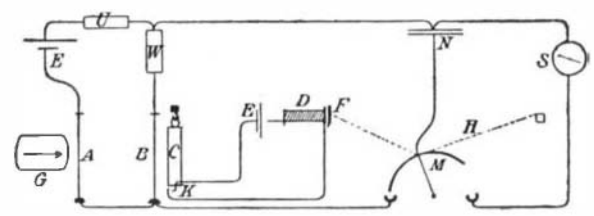
The current Supplement, No. 1574, opens with a summary of the granite industry of New England. Of interest to mining engineers are Dr. Kunz's statistics on the precious stone industry in 1904, and some data on the coal mines of Japan. G. T. Beilby contributes a very interesting paper on gold molecules in the solid state, giving valuable results of most interesting experiments. Some analogies are drawn between light and electric waves, in an article by Prof. B. Dessau. The American Society of Heating and Ventilating Engineers by a strange coincidence happened to hold its annual meeting on January 17, 1906. Two hundred years ago on this very date Benjamin Franklin was born. For that reason the interesting paper which was read before the Society on "Benjamin Franklin, the First American Heating and Ventilating Engineer," should prove valuable. The paper is published in full. At the opening meeting of the Society of Mechanical Engineers, President J. R. Freeman read a paper on the safeguarding of life in theaters. The paper, which is abstracted, is the result of painstaking investigations on the author's part. A simple photographic and photo-micrographic apparatus is so clearly described and illustrated that any one can construct it. Dr. Alfred Gradenwitz writes on a modern testing plant for gasoline automobile motors. Some specifications of material used in high-speed automobile and motor-boat engines are published. A. L. Johnson contributes an excellent paper on steel for reinforced concrete.

SPEED AND ENERGY LOSS OF PROJECTILES IN WATER.

The singular explosive phenomena that are observed whenever rapidly-moving projectiles strike liquid masses have been investigated of late years by many experimenters, and it has been shown that neither the revolution of the projectile nor the heating it undergoes plays an important part. It has likewise been demonstrated that the phenomena are not due to the effect of hydraulic pressure, as the vessel does not explode until after the bullet has left it. In order further to study these interesting phenomena, Martin Gildemeister and Hans Strehl (see Annalen der Physik, Vol. 18) recently undertook tests to ascertain the magnitude of the forces concerned.

The kinetic energy imparted to the liquid is a maximum equivalent to that lost by the projectile as it passes through the liquid bulk, the amount immediately converted into heat being in all probability very small.

The arrangement used by the authors is represented in the accompanying illustration. After first breaking the wire A, the projectile causes the condenser N to be discharged through the resistance W, which is free from self-induction, the discharge ceasing as the second wire B is broken. The time elapsing between the two occurrences is calculated from the residual charge of the condenser, its capacity and initial charge



SPEED AND ENERGY LOSS OF PROJECTILES IN WATER.

being known. The following law is derived from the authors' experiments:

The loss in velocity of a projectile in water is proportional to the first power, and the loss in energy to the second power of the velocity of the projectile on entering the liquid.

A New British Range Finder.

The British Naval Department has adopted a new type of range finder, which is stated to be of great value. It is the invention of Lieut. Arthur Vyvyan, the details of the mechanism having been carried out by Mr. Newitt, R.N., an electrical engineer. The utility of this instrument is for automatically transmitting the range observations from the fighting control top to all the various gun positions on board the vessel simultaneously and automatically. There are a series of electric motors, one stationed in the fighting control top, and one at each gun position. These motors all run at a uniform speed, and when there is any movement in the one at the fighting top, the others are similarly affected automatically. For instance, when the officer in the fighting top descries a vessel or object to be brought under fire, he estimates the range, and instructs the officer in charge of the motor appliance. A trial shot is then fired some distance short of the estimated distance, say 400 yards. The instrument is set running for this distance, and by means of an indicator and pointer the range is transmitted immediately to the various gun positions, the instruments at which record simultaneously upon their indicators. Should the range prove too short, another shot is fired, the distance being increased by say one-half the underestimate, viz., 200 yards. The result of this second shot will bring the instrument's pointer to about the correct range. If not, then another shot is fired, the range being again proportionately increased. These trial shots only occupy a few minutes, and directly the correct range has been obtained by the recording officer in the fighting top, all the various gun positions have it as well, and firing can be continued without any delays. The instrument provides automatically for the deflection of the range and the speed of the ship. The transmitter has proved completely satisfactory under test, the correct range being invariably obtained by the second trial shot. It has been perfected during the past year, and is now in operation at the gunnery school at Whale Island and on board a war vessel, and its utilization is to be extended throughout the service.

A TRIPLE-SCREW MOTOR TORPEDO BOAT.

The torpedo boat shown under way in our illustrations is one of the latest productions of the English firm of Yarrow & Co. It is an exceedingly speedy craft, having excellent sea-going qualities and being intended to take the place of the usual steam-propelled second-class torpedo boat. The boat is 60 feet in length by 9 feet beam, and is fitted with triple screws and three four-cylinder Napier gasoline engines—two of 120 horse-power for the outer propellers and a 60-horse-power engine for the center propeller. The last-named propeller is reversible, and it is thought that a single reversing propeller is all that is necessary for this type of craft.

In a series of speed trials made recently this boat developed a speed of 25½ knots when running light. This is an advance of 5½ knots over what could be obtained under the same conditions with a boat having a steam power plant. The reasons for this increased speed are the much lighter weight of the machinery (there is probably a saving of some 50 per cent), and the form of hull, which, at these high speeds, for the displacement of a boat of this type, seems to enable it to skim or glide over the surface of the water—a fact made evident by the small surface disturbance. The power which is usually absorbed in making waves is therefore utilized for propulsion.

A motor boat of this type, if fitted with a revolving torpedo tube, could be readily used as a second-class torpedo boat, or as a gunboat for coast-guard service. On account of its light weight, which does not exceed 8 tons, it is quite easy to transport such a boat on a larger vessel to any part of the world. Regarding the cost of such a boat the statement is made that fifteen of them could be built at the cost of a modern destroyer. For the purpose of defending a port from an attacking or blockading fleet, there is scarcely any doubt that fifteen small, high-speed motor boats of this type would offer a considerably greater means of defense than one destroyer of large size upon which the fire of a number of guns could be concentrated.

In line with the construction of this first motor torpedo boat for the British navy mention should be made of the fact that Mr. Lewis Nixon, who built the motor boat "Gregory," that crossed the Atlantic a year ago and was subsequently sold to Russia, has designed and built for the Russian navy no less than ten of these small, high-speed craft. These are said to have a length of 90¼ feet and a displacement of 35 tons. They are driven by twin screws, each of which is driven directly by a reversible marine gasoline engine of 300 horse-power. A speed of 20 knots is obtained at 400 R. P. M. of the engines.

This is a second example which has occurred within the last five years of how backward our government is in seizing new and worthy inventions as soon as they are brought out. The other case in point is the Lake submarine torpedo boat, which, although tested and found far superior to any other boat of the kind either here or abroad, was abandoned and its inventor allowed to sell it to foreign powers, one of the largest purchasers among these being Russia.

The Color of Water.

L'Illustration (Paris) gives the following results of recent experiments on this subject:

"After long hesitation, scientific men agree to-day in admitting that water *physically* pure, seen in mass, is sky blue. This color is that taken by the white light of the sun when absorbed by the water, in consequence of a phenomenon the explanation of which would be a little long. It is not due to the *chemical* purity of the water, since the sea (which is the bluest water) is also that which contains the most salt. Nevertheless, according to Forel's experiments, the matter in solution should be the predominant cause of the modification of color; upon which act besides the matter in suspension, the color of the bottom, and the reflection of the sky and of the banks. Consequently blue water is pretty rare in nature; a good many seas and lakes that give us the impression of this tint are green. The water at present acknowledged to be the bluest is that of the Sargasso Sea, between the Cape Verde islands and the Antilles. The water of the Mediterranean off the French coast and around Capri is bluer than that of Lake Leman, much less blue itself than that of the lakes of Kandersteg and Arolla, in Switzerland.

"Hitherto they have not exactly determined the relation between the color of water and its degree of purity. The Belgian, Prof. Spring, who has been a long time studying this delicate question, has just communicated to the Academy of Sciences at Brussels some interesting figures. Pure water containing a millionth of ferric hydrate appears brown under a thickness of 6 meters; a ten-millionth is sufficient for it to be green; and, in order that it may remain blue, is needed less than a twenty-millionth. As to humic matter, it causes the blue coloring to disappear in a quantity less than a forty-millionth. The calcic compounds should have a great influence upon clarification, as they eliminate, up to a certain state of equilibrium, the ferric and humic compounds."