

TUNNEL BORING MACHINE.

The illustration of the boring machine for tunneling the English Channel, herewith shown, is from a photograph furnished by Mr. Thomas English, the patentee of the invention. The main framing of the machine consists of two parts. The under frame or bed is of trough like form; fitting the lower part of the circular tunnel, and having at its upper edges suitable guides parallel to the axis of the tunnel, along which the upper part of the framing is fitted to slide longitudinally.

On the upper frame the axis of the boring head is mounted in bearings with gearing and an engine worked by compressed air, so as to cause the boring head to revolve slowly. The axis of the boring head extending backward is made tubular and fitted with a piston, the rod of which projects backward and is fixed at its end to the under frame or bed. An air engine works hydraulic pumps, whose throw can be varied at will, forcing water into the hollow axis of the boring head through a channel provided within the piston rod, and thus causing it to advance while it revolves. When it has advanced as far as the length of the guides permits, the gearing by which it is revolved is disconnected from the engine, its axis is relieved from the hydraulic pressure, and by means of four hydraulic jacks projecting down from the upper framing and made to bear against the lower part of the tunnel, the whole machine is slightly raised. The water under pressure is then admitted into the annular space round the piston rod, and while the upper frame remains stationary the under frame or bed is caused to advance under it, after which the lifting jacks being relieved from pressure allow the bed to take its bearing in its advanced position, and the boring head is again put in motion forward.

The boring head consists of two strong radial arms pro-

Exhibition of Insects.

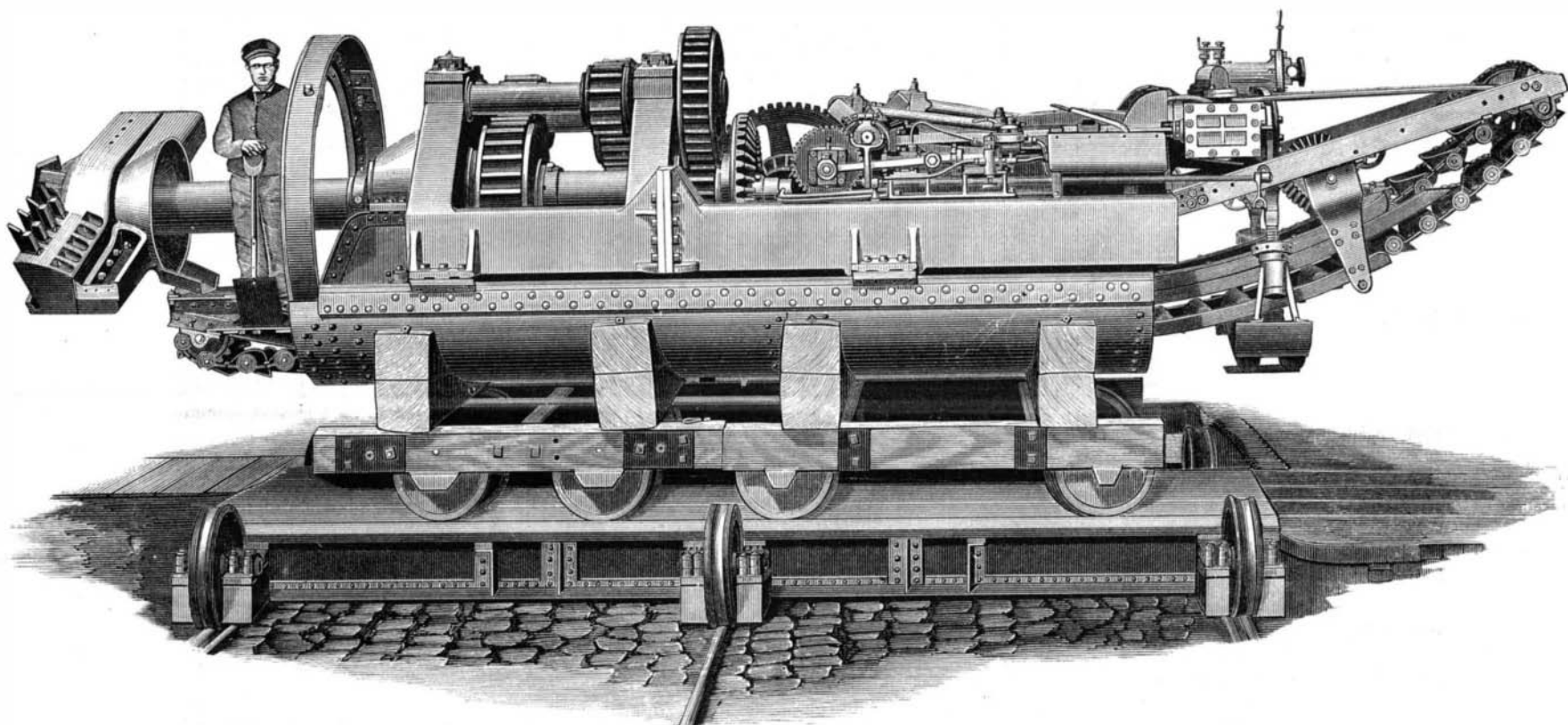
The exhibition of insects lately opened at the Palais de l'Industrie, is the twenty-sixth exhibition of insects held in Paris under the auspices of the Societe Centrale d'Apiculture et d'Insectologie, the object of the society being to classify and improve the insects useful to man, and to point out the best means of extirpating the noxious ones, or at least of checking their ravages. The association, at the head of which is Dr. Marmottan, deputy for the Department of the Seine, has succeeded very well in its attempts, and the exhibition this year is, says the *American Register*, organized on a very complete scale, being composed of four main divisions and one subsidiary one (devoted to snails and slugs). The first division comprises all insects of recognized utility to man, and the various stages of their development, from the egg to the perfect state. The second division contains noxious insects; they have very advisedly been classed, not according to the scientific grouping, but according to the plants they prey upon. There are ten classes in the noxious division, the first six of which include the parasites of vegetables and trees; the seventh and eighth contain the insects which prey upon timber and upon manufactured materials, silk, linen, etc.; the ninth class comprises the ordinary parasites, such as the flea, etc.; and the tenth the insects injurious to pisciculture. The third division groups together all the birds, animals, and reptiles which tend to destroy the harmful insect, and thus act as friends to man. The fourth division is devoted to the arts and manufactures more directly connected with the cultivation of insects. The principal features of the exhibition are naturally the silkworm and bee, with their various methods of culture, products, etc. Apiculture is not very largely represented at the exhibition of insects, and if the bee industry is not better carried on in

exhaust suction a large shaft runs from the foul air chamber down to the back of the kitchen fire, where the heat of the boiler and the fire suffice to attract the air. From the back of the kitchen fire, in the basement of the house, the air again travels up. A square brick shaft or chimney conveys it through the roof and into the open. In the center of this shaft is a circular metallic flue, which carries away the smoke of the kitchen fire, and this flue, always more or less heated, stimulates the current of air. A comparison of the minimum velocity at which the air moves forward in the extracting flues (200 feet per minute) with the cubic contents of the house, shows that the atmosphere is entirely changed throughout the dwelling once in every twenty minutes. This result is obtained imperceptibly—that is, without the slightest draught; yet ten persons smoking in one room felt no inconvenience, and next morning there was not the slightest trace or taint of tobacco odor remaining."

It is claimed that in addition to the equal heating of the entire house, the cost of fuel is reduced one-third from that of the ordinary method. But as the common way of heating houses in England is by open grates, this proportion might not be applicable to the American system of furnace or stoves.

The Mineral Riches of Tonquin.

Its gold mines, says a writer in the Paris *Figaro*, can rival those of California and Australia. The natives use that metal for exchange; the females of the Muongs of the Black River, on their way to and from market, gamble with thousands of francs' worth of it, without caring whether they win or lose. The mines of Talan, near Yuen-Kiang, on the Red River, were visited by the Commission of the Meikong, who found gold there in bars as well as dust.



IMPROVED BORING MACHINE USED IN THE CHANNEL TUNNEL.

jecting in opposite directions from the axis, each arm having through it a number of cylindrical holes to receive tool holders which are clamped therein by keys, and any of which can be withdrawn backward for the purpose of repairing or replacing their tools. The cutting tools are so arranged as to cut concentric annular chases in the face of the rock, leaving between them narrow portions of the material, which can be readily broken away, or which crumble away while the machine is at work. Within the trough hollow of the bed are arranged inclined worms which cause the excavated material to travel backward and upward, so that it is delivered behind the machine into trucks, by which it is removed from the tunnel. We are indebted to the *Engineer* for our cut and the above particulars.

The Refuse of a Great City.

In New York the garbage and ashes are placed in boxes and barrels on the sidewalks and removed daily by the carts of the Street Cleaning Department, which haul them to the nearest department dock, where they are dumped on scows; and these scows are towed out to sea in deep water and there emptied.

The street sweepings are disposed of in a similar manner.

The offal, such as dead animals and diseased meat, comes within the province of the Health Department, which lets out by contract to certain parties the removal of this material from the entire city. For this present year this work is done for \$40,000. The offal is taken by the contractors to Barren Island and then converted into fertilizers.

Two kinds of street sweeping machines are used, says *Engineering News*, one made by the Chapman & O'Neil Manufacturing Company, at No. 291 Avenue C, New York, and the other, called the "Boston machine," made by the Abbot-Downing Manufacturing Company, of Concord, Mass. A single horse machine costs about \$350 to \$400.

France than would seem to be the case from a visit to the Palais de l'Industrie, there is room for improvement in this respect. Sericulture, as the French term the rearing of silkworms, is also inadequately represented at the exhibition; indeed, the only silk grower of any importance there represented is Baroness Hérold de Pages, who owns a large *magnanerie*, or manufacture of silkworms, at Lourmaria, in the Department of Vaucluse. The show of bee hives is good enough, and the honey exhibited is of very fine appearance. Butterflies and beetles, some of them classed as noxious and others as useful, are very numerously represented. The section of snakes and lizards (exhibited on account of their relations to insects—the relations of the destroyer and the destroyed) is more complete than might have been expected. The owl, so fatal to mice and rodents in general, stands all by himself in a post of honor, while the rodents who destroy grain are pilloried in cages.

Heating and Ventilating a Dwelling.

The London *Lancet* describes an experiment recently made by Dr. Hogg, of Chiswick, in warming, cooling, and ventilating a dwelling. The house has not been built long enough to thoroughly test the means for cooling the compartments, but the warming and the ventilation work admirably. "None of the windows can be opened. There is but one fireplace, that in the kitchen. Underneath the hall a large passage is used as the intake of fresh air. Here it can be cooled in summer by ice or water spray, while in winter it is warmed by hot steam pipes, which are economically heated by a small coke stove. The air then passes up into the hall, from which it is only separated by an iron trelliswork, and travels into every room of the house by apertures made in the skirtings and cornices. In the ceiling of each room there are one or two openings and exhaust shafts, leading to the foul air chamber in the roof of the house. To produce the

Still higher near the source of the Red River, the precious metal is obtained in large quantities. Silver also is not rare, and copper is found everywhere, all the domestic utensils of the people being made of this metal. The tin mines are not worked for want of capital, although those worked near Mong-tsze, in Yunnan, near the Red River, are the most valuable known to exist. Zinc, lead, iron, and bismuth are also known. The coal mines, however, are the most important of all. Tonquin produces also musk, tortoise shell, mother-of-pearl, wax, silk, peacocks' feathers, as well as those of the blue pheasant, and other birds of brilliant plumage. "In short," concludes the *Figaro*, "it is a rich country, and worth the trouble of occupying it."

Oily Substances in Rice.

According to G. Campari ("Annals of the Milan Society of Applied Chemistry"), oily substances are contained in large quantities in the embryo of the rice, which he finds to be composed of 95.54 per cent of fatty acids, and 4.46 per cent of glycerine. Treatment with bisulphide of carbon produces a yellow wax-like substance which readily saponifies with bases, melts at 32° C., becoming quite solid at 28° C., with a specific gravity of 0.93005. It is completely soluble in ether, chloroform, and benzene; its composition appears to be C 79.2, H 10.9, O 9.9 per cent. The fatty acids melt at 36° C., emit a perceptible pear-like odor, and yield, when saponified and heated with magnesium acetate, a body which melts at 62° C., and exhibits the composition of palmitic acid—C₁₅H₃₁O₂.

THE pine forest along the Adriatic at Ravenna, Italy, celebrated by Dante and Byron, and which furnished the shipyards of Rome and Venice, are to be cut down, because an excavation for a railroad has so drained the soil that the trees have died.