

THE INDUSTRIES AND RESOURCES OF JAPAN.

We have already alluded to the magnificent display made by Japan at the Centennial, which, for completeness, even to the smallest minutiae capable of affording useful information relative to the industries and resources of the country, certainly transcends the exhibit of any other nation. This, perhaps, is due to the fact of Japan having entered into the spirit of the enterprise with a heartiness, born of a natural pride in her rapid progress, and in no small measure owing to the knowledge that, in that progress, the people of the United States have been most nearly concerned. Prior to the Vienna Exposition of 1873, the Japanese had never participated in any World's Fairs, and even at the Austrian show the contributions were mainly purchased and forwarded by the Japanese government, private individuals neither appreciating the advantages of the display nor being willing to send their goods over so long a journey. For the Centennial, however, a different feeling has been manifested. As early as the summer of 1874, it was definitely decided that Japan should participate, and at once the most thorough measures were set on foot for securing the superb collection now here. Provincial authorities were instructed to do their utmost to induce the leading manufacturers to prepare exhibits and to assist them with money and advice. Those who had acquired experience at Vienna were called upon to give the benefit of it to their countrymen. The government set an example by spending \$30,000 for its official collection, and appropriating a further sum of \$70,000 in making advances to various manufacturers so as to assist them in the production of such pieces of workmanship as would do credit to Japanese art and industry. In addition to this, the sum of \$300,000 was set aside for general expenses, including the cost of transport and freight; and lastly, the government charged itself with the traveling expenses of all such exhibitors as might wish to accompany their goods to Philadelphia. Certainly no government has ever manifested greater liberality toward its people in any similar enterprise; nor can such munificence be regarded otherwise than in the light of the highest of compliments to the people of the United States and their Exposition.

A general description of the exhibit of Japan has already appeared in these columns. Lately, however, the Japanese Commission has issued a work, modestly termed an official catalogue, but which is really very much more, since, out of a hundred and thirty pages, thirty only are given to the list of articles, and the remainder are devoted to a series of excellently written descriptions of the principal resources and industries of the country. With this volume the visitor can study the entire exhibit intelligently, for he has before him the details of the manner of production of all curious and elegant articles displayed. We shall make copious extracts from the pages of this work, beginning with the subject of

MINING AND METALLURGY.

Very little is known about the origin of mining in Japan. It is, however, a fact that several mines were being worked during the latter part of the eighth century (Japanese period Dia-Do); and the large number of old abandoned adits, which are to be found in the metaliferous districts, leave no doubt as to the fact that mining was in a flourishing condition centuries ago.

The system of working mines has changed but little since olden times, and consists simply in driving one or several adits from places where a vein or seam appears on the slope or top of hill; the vein is followed as far as possible, and, when necessary, lower adits are driven, until in the end it is found impossible any longer to overpower the water with the very imperfect machinery used for pumping and draining. Many mines have had to be abandoned after a longer or shorter period of prosperity, solely on this account. In certain instances great efforts have been made to avoid this misfortune, and adits have been driven for the purpose of draining off the water. Thus in the lead mines of Hosokura, in the province of Rikusen, a draining adit may be seen of 8,370 feet in length; nevertheless the mine has been almost entirely abandoned, and the actual working places are at present far below the level of the water adit in question. In the mines of Udoge, where the rock is very soft, a water adit 13 feet high and 10 feet wide was commenced a few years ago. Ever since the earliest times the timbering of the adits has been known and effected with all the necessary skill; and as the wood is both abundant and cheap in most places, it has not been spared. The dimensions of the adits vary greatly; in some mines they are so narrow that it is almost impossible for a full-grown person to pass through, and consequently children have to effect the transport of the mineral. The latter is usually packed in strong sacks, made of matting, which are fastened to the child's back by means of a rope. In many places the passage becomes so low that the child has to crawl along on all fours, dragging the sack of mineral behind him. The ladders, used for getting from one adit to another on a different level, are simply trunks of trees with steps cut into them.

The means employed by the miner for attacking the rock consists merely in the use of hand tools, namely, the pick, the gad, the hammer and chisel. Gunpowder has only been brought into use for blasting purposes in latter years, and its introduction is chiefly due to foreigners.

The apparatus used for removing the water is composed only of small wooden hand pumps, buckets, and occasionally of a kind of water wheel with scooping paddles, and moved by treading; the water pipes are either made of bamboo or wood. As regards the ventilation of the mines, it is often realized with more or less of perfection, by connecting two adits of different levels, and in some cases by run-

ning an air channel, made of wooden planks, throughout the whole length of the adit, so as to allow the air to circulate through the adits and this channel. In the lowest adits, however, the absence of sufficient ventilation has in many cases caused them to be abandoned or else to be worked on a very small scale only. The lighting in the mines is either effected by torches of dried bamboo or oak wood, which latter is beaten until it becomes soft enough to burn easily; or by iron lamps in the shape of saucers with a double suspension. Sometimes the lamps consist merely of a kind of murex shell containing vegetable or fish oil. The wick is made of the pitch of soft rush (*juncus effusus*), which is also used for wax candles and ordinary lamps.

The annual production of the mines of Japan, in gold, silver, copper, iron, lead, tin, coal, and coal oil, was valued in 1875 at \$3,687,275.

Of late years the government has made great efforts to improve the condition of mining and metallurgy, the principal shortcomings of which are: 1. The insufficiency of machinery for pumping out the water. 2. The imperfect system of attacking the rock with only hand tools, which, together with the custom of leaving the mine to be worked entirely by contracting miners, without any system and under no control, has not only the effect of causing a great part of the vein to be left untouched, but also in many cases the future of the mine has been endangered by the total absence of any well combined plan. 3. The imperfection, and consequently the expensiveness, of the processes employed for dressing, preparing, and smelting the ores. Some mines, however, such as the Takashima coal mines, near Nagasaki, are now being worked according to the modern system and are provided with the necessary steam power.

The working of several other mines is being improved in the same manner, and the new works are already in course of erection at the silver and copper mines at Ikuno, Sado, and Ugo. The government mining department has also commenced the construction of several high furnaces for the smelting of iron ores.

It will be observed that an excellent field is here open for improved mining inventions of all kinds.

MINERALS, ORES, ETC.

The veins of gold and silver ores in Japan are generally composed of quartz, native silver, silver ore (argentite and antimonal silver), containing more or less gold and iron and copper pyrites, occasionally mingled with blende and galena.

The most important and almost the only iron ore worked till now is the magnetite, found either in the shape of solid masses or in that of sand. In general the magnetic ores contain from 62 to 65 per cent of metal. The magnetic sand and the solid ore are the only materials used for smelting iron; however, iron glance and brown hematite, with 56 to 60 per cent of iron ore, are also found in Japan. Copper ore is found in many places, and may be considered as a rich ore, since it contains on an average from 10 to 15 per cent of metal. It is composed mostly of copper pyrites, together with more or less iron pyrites, and is found chiefly in clay slate. The principal mines are situated in the northern part of the island of Nippon, but ores are also found in more southern provinces, as for instance in Bichiu. Sometimes the ores are much richer than has been stated, and contain 25 to 35 per cent, even up to 55 per cent, of copper.

The lead ores which are found in Japan are mostly galenas, with 40 to 80 per cent of metal, and sometimes a small quantity of silver. Tin ore is found in Satsuma, Suwo, and Bingo.

In later years, attention has been drawn to other minerals, such as gray antimony and bixide of manganese; but they are, as yet, without great importance. A cobaltiferous mineral, which is found in the shape of small pebble conglomerates in the bed of certain rivulets, has been known for many years. After the raw material has undergone a certain process of powdering, washing, and calcining, it is used for blue porcelain paintings.

COAL, ASPHALT, PETROLEUM.

The most important coal fields are those in the northwest of the Island of Kiushiu, in the district of Karatsu; and also in the Island of Takashima, near Nagasaki. The total yield of the Karatsu district may be estimated at 80 to 90 tuns daily, which is sold at neighboring ports at \$4 to \$5 per tun.

The working of the rich seams in the island of Taskashima, about eight miles west of Nagasaki, has been commenced on the modern system, with improved machinery. This mine, actually the property of a Japanese company, is now very prosperous, and produced 78,000 tuns in 1874. In the island of Amakusa, on the west side of Kiushiu, a sort of coal is found, which is very much like anthracite.

As the industry of the country is being developed by the introduction of new methods and machinery, so will the demand for mineral combustibles increase, and mining will be effected on a much more extensive scale.

Petroleum is found in the districts to the northwest of Tokio, as, for instance, in Yechigo, Shinano, Ugo, etc. In the first of these provinces oil was discovered 300 years ago, and it has always been counted among the seven wonders of Yechigo that a natural combustible gas issuing from the ground in certain places, and could be brought through bamboo pipes into the interior of the houses and used for illuminating purposes, as it is now used for heating the small stills for refining the crude oil. Although the presence of the oil has been known for a long time, the people of the country only began to use it forty-six years ago. Since then, no less than 508 wells have been sunk.

BUILDING MATERIALS.

Although building stones are by no means scarce, yet they have been seldom used for houses, but mostly for foundations, temple stairs, gateways, sea walls, and battlements, which latter are sometimes of enormous extent: as for instance in Tokio and Osaka, where some granite stones of 30 feet in length by 18 feet can be seen. The battlements and walls are generally made of well dressed blocks of irregular shape, built up without the use of mortar. The chief materials used for these different purposes are granite, trachyte, and trachytetuff.

All kinds of colored mixtures of sand, clay, and lime, and mineral colors, are prepared for plastering the inner walls of the houses, and a very fine black stucco is used for the exterior of the fireproof warehouses. In order to give the plaster more solidity and coherence, paper fibers (prepared by boiling old paper) and the gluish decoction of a fucus, called *fu*, are mingled with the powder.

CLAY, KAOLIN, SILEX, ETC.

Minerals used for pottery of all kinds, such as clay, kaolin, sillex, etc., are very abundant in Japan, and are spread over all the country. In the small town of Arita, province of Hizen, the head center of the porcelain manufacture in Japan, within a very limited circuit, not half a mile in diameter, there are found, imbedded in the rock at different places, all the materials necessary for the biscuit, for the coating of the ware before glazing, for the glaze, for the *cragué*, etc., the best being of such good quality that, after being powdered and decanted, it is used without any further mixture for the finest ware, the so-called egg shell porcelain. In the central part of Nippon, where granite is the principal constituent of the mountains, in the province of Owari, Yamashiro, and the island of Awajishima, opposite Hiogo, beds of petuntse, very much like the Bohemian material, are to be found. When used for porcelain, this material is mixed with silicious felspathic minerals from other places. A thorough mineralogical and chemical examination of these minerals has not yet been made, but would, no doubt, prove to be of great interest. Graphite has been discovered in Satsuma and Rikuzen; certain very pure samples have been found fit for such purposes as the manufacture of pencils; but in this case it would have to be washed and ground with an addition of clay. Whetstones, grindstones of all qualities, are very abundant, and are in the hands of every artisan, who, on account of the softness of his cutting tools, is frequently obliged to have recourse to the whetstone. Garnets are used for grinding and polishing hard materials.

Naval Items.

The naval appropriation bill, which became a law on July 1, reduced the rank and file of the United States navy to 7,500 men. To conform to this reduction, all enlistments and re-enlistments have been stopped; and since the beginning of the month more than 1,000 men have been discharged.

In consequence of the smallness of the appropriations, orders were issued by the Department, on July 11, to suspend all work for the government which was in progress, under contract, at the various private machine shops in the Eastern and Middle States.

NAVAL ENGINEER CORPS GAZETTE.

July 11, Past Assistant Engineer George P. Hunt and Assistant Engineer A. B. Willits, were ordered to the monitor Wyandotte. In addition to their duties on board that vessel, they will have charge of the machinery of the other monitors at Norfolk, Va.

Passed Assistant Engineer I. R. McNary and Assistant Engineer A. F. Dixon were, on the same day, ordered to the monitor Ajax, at Port Royal, S. C. They are to have charge also of the machinery of the other monitors at that station.

The tractive force of horses is as follows:
Rate in miles per hour: 2 3 3½ 4 4½ 5.
Tractive force in lbs.: 166 125 104 83 62 41.

DECISIONS OF THE COURTS.

United States Circuit Court—Western District of Pennsylvania.

SHOUF et al. vs. HENRICI AND LENZ.—PATENT OIL WELL TUBING. (In equity, No. 15.—May term, 1872.)

In a proceeding for infringement of a pump patented and designed for use in oil wells, the defendants proved the existence of a pump used in a salt water well, consisting of the identical combinations claimed by complainants, and the results produced by the latter pump were the same: Held, that although subsequently the whole combination in the latter pump was not used, it was not such an abandoned experiment as would allow the complainants to recover.

Where, in a defense to an action for infringement of a patent, the defense proved the existence of the same combinations in a device used for analogous purposes, and in which no change of mechanism was needed, and the operation of such device was successful, it was: Held, that the patent upon which the suit was brought could not be sustained, although the use of the device shown in defense was altogether discontinued.

This would only leave it open to the public to use it. No subsequent inventor could take it up and appropriate it exclusively. MCKENAN, C. J.:

The complainant's patent is for a combination of a pump tube, an outer or larger tube or casing, and a seed bag outside of the latter. It is designed for use in oil wells, which are usually of great depth and small caliber, and its object and operation are to allow the escape of gas from the bottom of the well through the space between the pump tube and the outer tube or casing, so that it will not necessarily pass through the valves of the pump chamber and obstruct the operation of the pump.

The defendants admit that they have used the combination described in the patent, and justify such use upon the ground that the patentee was not the first and original inventor of the combination claimed by him, but that it was known to and used by others before the date of his alleged invention.

I am satisfied that this defense has been maintained; but I do not propose to state at length the reasons upon which this conclusion is founded, or to advert in detail to all or any of the proofs in the cause which have induced it. It will suffice to refer to one instance of its public and notorious use before the date of the alleged invention of it by the patentee. This occurred at what is called the Donnelly well, and years before the patentee ever conceived the idea of his invention. It was a well of small caliber, and sunk to a considerable depth to obtain salt water. The device used in it for that purpose consisted of an outer tube or casing, with a seed bag outside of it and next to the wall of the well, and a pump tube inside of the casing, with a space between them. A large volume of gas was evolved in the well, and it escaped freely in the interval between the casing and the pump tube, without passing through the pump valves. It is hardly disputable that these devices and the patentee's invention were substantially identical in their construction and arrangement, and that they operated alike in furnishing a vent for the gas.