Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY

At No. 37 Park-row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Two Dollars per annum.—One Dollar in advance, and the remainder in six months.

Single copies of the paper are on sale at the office of publication, and at all the periodical stores in the United States and Canada.

Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.

☞ See Prospectus on last page. No Traveling Agents employed.

VOL. II., No. 11.....[NEW SERIES.]....*Fifteenth Year.*

NEW YORK, SATURDAY, MARCH 10, 1860.

THE POWER OF COAL.

T the present moment the island of Great Br tain is the richest in the world. People from almost every quarter of the habitable globe resort to London to raise the means necessary to build railroads, construct ships, sink mines, and to carry out other engineering projects where vast outlays of money are required. This is a strange spectacle, truly, and how can we account for it? The island is insignificant in extent; the population small, in comparison with many other countries, and the climate is well known to be capricious. Its increased riches are not owing to the number of its inhabitants, its extent of territory, the richness of its soil, or the serenity of its climate; the source of its great wealth lies beneath its surface, in the deep and dark coal mine, where the Author of Creation has stored up the accumulated vegetation of byegone ages for the development and use of this age of steam, iron and manufactures. The skies of Italy and France are sunny and bright, and the purple vine covers the slopes of Burgundy and Piedmont; while the skies of England are murky, and the sunlight, even in flowery Devonshire, is too cold for the grape to yield its fruitage. Yet, with all these disadvantages on the part of England, Italy is poorer and France less wealthy; for with the products of her mines and minerals other countries have become her tributaries.

From an article in the last number of the *Edinburgh Review*, on Professor Rogers' essays on the coal formations of North America and Great Britain, we obtain a more exalted view of the power of coal than we ever entertained before. We derive from coal our artificial light and heat; it is the latent force which gives life to the steam engine; and it is the concentrated energy which propels our countless forms of mechanism. It is a subject of intense wonder that perishable vegetable formations which flourished long before man appeared on the globe, should have been covered up for centuries beneath the rocks and now rendered subservient to the latest applications of human skill, for increasing the productive powers of man to an extent which almost baffles the mind to calculate. The mechanical power of England represented by 10,000,000 tuns of coal devoted to steam engines is equal to the labor of 66,000,000 of strong men per annum. Is it any wonder that such a stupendous power should have given England the mastery in commerce and manufactures? The possession of coal mines are momentous in their consequences; and the annual product of England for all purposes is no less than 68,000,000 tuns. In the Middle Ages, France and Germany supplied England with all kinds of manufactures; but the tide of commerce is changed, and all owing to the natural possession of great coal mines, of which there are no less than 3,000 in the island. A commission of French cotton manufacturers who visited Manchester, three years ago, made a report on their return, and declared that although English operatives were paid higher wages, yet, owing to cheap fuel and machinery, they could produce cotton goods at about one-half the price of the French. Such is the power of coal!

We may take it for a settled fact that the country which possesses the greatest deposits of coal contains the greatest resources of mechanical and industrial power. Were the coal fields of England to cease being productive in 1860, the wealth and power of Great Britain, which are developed in her steamships and countless manufactures, would be annihilated, and the kingdom would sink to a diminutive power in a few years. The coal fields of the world are distributed as follows:—United States, 196,000 square miles area; British North American provinces, 7,530; Great Britain, 5,400; France, 984; Prussia, 960; Belgium, 510; Bohemia, 400; Spain, 200; Russia, 100. The extent of the Pacific and Asiatic coal fields is unknown. From these geological coal statistics it is not difficult to predict what country is destined to be the future mistress of the world in wealth and power. Owing to the vast amount of coal raised in England annually, many of the mines will be worked out in 300 years; and at the present rate they will *all* be exhausted in about 1,000 years. Long before that date, the "Court of St. James" may be transferred to Nova Scotia or New Brunswick, where the coal fields are rich and extensive; but whether such a a result ever takes place or not, the future superlative greatness of the United States is just as certain as that the sun shines. On the other hand, it is equally evident that Russia never can become a great power; she may have the muscle, but she never can have the *steam* to become an industrial giant. According to the operations of natural laws our wealth must increase with the development of our coal power, of which we have a natural treasury thirty-four times more extensive than that of England. It is only a question of time, for the United States to become the great mistress of the world, and her coronal will be a wreath of *black diamonds!*

QUARTZ-CRUSHING MACHINERY.

This is a most interesting subject to our miners, who are now neither few nor far between in wealth and numbers. In Virginia, North Carolina, Georgia, Tennessee, California and Arizona, many companies are now engaged in this kind of mining for obtaining gold, silver and copper; and the best mill for crushing the quartz is an object of the very first consideration. Many miners consider the old stampers, combined with the Chilian mill (large rollers), the best quartz machinery that has ever been tried. Still there are opposite opinions to this; and it is well known that quartz mills have called forth an immense amount of novel invention, and yet dissatisfaction prevails in the minds of many miners in regard to all the machines yet tried. In this state of the matter, we find some information on the subject published in the London *Engineer*, it being the substance of a paper read before the Society of Engineers by P. F. Nursey. He mentions Cochrane's, Berdan's and Dr. Collyer's American crushers, but he gives the credit of the best machinery known in England at present to Mr. J. Mitchell, a chemist. He employs conical friction rollers between iron balls, rotating in an annular trough. The conical rollers are in contact with the balls, and communicate to the latter a rotary motion on a vertical axis, in addition to that around a horizontal. The quartz ore is reduced to an impalpable state in this mill, then it is carried through twelve amalgamators, each of which is furnished with two revolving screws. The ore, in its passage from the quartz-crusher to its exit at the last amalgamator, traverses in an hour a distance of 11 miles, within the compass of an amalgamating house only 30 feet in length. It is stated that this apparatus is coming into extensive use in the South American gold and silver mines, with an increase of precious metal in its working amounting to 250 per cent—a prodigious increase, if true.

Gold exists in almost every part of the world in some form or combination, but it is found in few places in sufficient abundance to pay for the expense of working, either by washing the sands or extracting it from the rocks by crushing and amalgamation. No country in the world possesses an equal amount, with ours, of natural gold resources; therefore every improvement, however small, is of much consequence, because we expect that our gold mines will employ large numbers of miners for centuries to come. In England gold exists in what is called *gossan*, which is a red oxyd of iron; also in the outcrop of copper and other metal lodes; but the quantity is so small to the tun that it does not pay for the working. It is only in the quartz rocks, as a matrix, that it has as yet been found in sufficient quantities to pay for the labor of extraction. Where fuel is abundant we counsel our gold-miners to roast their quartz before submitting it to the crushing mill, as it becomes much more brittle and easily crushed by the machines afterwards. We know that in several places fuel is too expensive at present to employ it for roasting the quartz; but for all such situations, efforts should be made to obtain cheap fuel by railroad or steamboat, as the roasting of the quartz saves an immense amount of mechanical labor.

THE WAY TO TELL THE TIME OF NIGHT BY THE STARS.

With suitable instruments, the time can be ascertained by the stars *more* accurately than it can in any other way; and it is easy to tell it approximately, say within half an hour, without any instruments whatever. Let us describe a simple, rough device for this purpose, as the easiest mode of explaining how it may be done by the unaided action of the eye and judgment.

Take a keg or barrel hoop, or a hoop of wire, and divide it into 24 equal spaces, marking the dividing points for hour points. Connect the opposite hour points by lines of fine twine drawn across the diameter of the hoop. Hang the apparatus against a north window, and place the eye in a line with the middle of the hoop (where the wires cross each other), and the north star. Now any of the fixed stars, in its daily revolutions about the pole, will pass from one wire to the next in an hour. Let us select the nearest pointer in the "dipper" (Alpha, Ursa Major) for the hour hand on our great clock of the heavens. Place the eye at such distance from the apparatus as to bring this star just within the hoop, keeping the center of the hoop in line with the North Pole. On the 5th of March, the star Alpha, Ursa Major, will be on the meridian, directly over the north star, and consequently in line with the upper vertical wire of our apparatus at 12 o'clock, midnight; and as it passes from one wire to the next in an hour, if it is seen in line with the first wire at the right of the vertical one, the time will be 11 o'clock; if in line with the second wire at the right, 10 o'clock; and so on. While if it has passed the middle, and reached the first wire at the left, the time indicated is 1 o'clock; the second wire 2 o'clock; and so on.

This star, in common with all the other fixed stars, comes to the meridian about four minutes earlier each night or day than it did on the preceding night or day. Consequently on the 5th of April it will reach the vertical wire at 10 o'clock at night, and the other wires at corresponding times; and this variation continues at the rate of two hours in each month throughout the year.

From this description, the mode will be readily understood of telling the time of night by the stars without the aid of instruments. We require to learn two stars—the pole star and that one of the pointers which is the nearer one to it—to remember that this latter star is directly over the north star at midnight on the 5th of March, and comes to the meridian two hours earlier on the 5th of each month than it did on the 5th of the preceding month. As the star revolves around the circle in 24 hours, it will, of course, revolve one-fourth the distance in 6 hours, being at right angles to the meridian 6 hours from the time it is on the meridian, and at an angle of 45° 3 hours from that time.

The apparatus which we have described will be more accurate if the top is inclined forward from the perpendicular at an angle corresponding with the latitude of the place in which the observer is located, bringing it perpendicular to the axis of the earth, and in a plane parallel with the plane of the equator.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Cooking Stove.—R. D. Granger, of Albany, N. Y., has applied for the extension of a patent granted to him on the 13th of June, 1846, for an improvement in cooking stoves. The petition is to be heard at the Patent Office on the 28th of May next; and the testimony closes on the 14th of that month.

Sugar Pan.—Elizabeth A. Harris, administratrix of Alfred Stettman, late of New York, deceased, has applied for the extension of a patent granted to said Stettman on the 16th of May, 1846, for an improvement in sugar pans. The petition is to be heard at the Patent Office on the 30th of April next; and the testimony closes on the 16th of that month.