Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

D. MUNN. A. E. BEACH.

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One copy, one year, for the U. S., Canada or Mexico.................. $3 00
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One copy, one year, to any foreign country belonging to Postal Union, 4 00

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MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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NEW YORK, SATURDAY, FEBRUARY 14, 1891.

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 789.

For the Week Ending February 14, 1891.

Price 10 cents. For sale by all newsdealers.

LOOKING FOR EMPLOYMENT.

There are in the United States, in this year 1891, five hundred thousand seekers for work—a half million people, of both sexes and all ages, looking for employment in gainful occupations—and only 460,000 places to be filled. This is the computation of Hon. Carroll D. Wright, United States Commissioner of Labor, and formerly for many years superintendent of labor statistics for the State of Massachusetts, an authority than whom there is none higher in this branch of investigation. The figures are based upon actual returns, from the census and other sources, of the total number of persons employed at different periods, and the increase of the population, showing an average percentage added yearly to the number of persons engaged in all occupations. That is, to keep up the integrity of the work of the country—to keep it up to its full average standard of progression, and fill up the places naturally made vacant—460,000 new places will have to be filled, while the increase of the population shows that there will, in natural order, be 500,000 applicants for these places, without counting, in either case, "the great army of unemployed which through all ages has hung upon the outskirts of civilization." These figures are arrived at, not only by the ordinary process of division over a decade of years, but by separate calculations based on the death rate and other elements.

What, then, is the duty of the boy or young man, impelled by a praiseworthy ambition, or forced by necessity, to seek occupation whereby he may rise in the world, or at least make sure of a comfortable maintenance? It is evident from the bare statement of the case that the problem will be, as it ever has been, a most serious one for a large proportion of the seekers for work. But there are other elements to be taken into the calculation. The figures given include women and children engaged as well as men, and, according to the census of 1880, the employed in all occupations were 85 per cent male and 15 per cent female. In the different kinds of work, agriculture employed 44·10 per cent of the laborers, professional and personal service required 23·43 per cent, trade and transportation 10·41 per cent, and manufacturing, mining, and mechanical industries 22·06 per cent. It will be seen, therefore, that there is not only a great diversity of employments offered to the upcoming seekers for work—a wide range of industries, to which new additions are being daily made—but that the computation includes all probable candidates for work from the young of both sexes.

In a competition that is so general, among competitors urged by motives of every degree of forcefulness, it can hardly be said that there is any inexorable law which decrees that only the most fit shall survive. It may well be, nevertheless, that the manner of survival, the degree of success obtained by each, will, as a rule, be determined according as the competitors are most fit for the places they are moving forward to fill. The world is full of people not lacking in a certain degree of willingness to work, or in general intelligence and ability, but who yet appear to find the greatest difficulty in obtaining permanent employment. The trouble with most of them is that they have no special fitness for any particular kind of work, and this is what employers of labor are everywhere seeking, with a degree of particularity never before so marked as at present. In all the new industries so constantly arising, expertness in the lines out of which these industries are developing is a vital necessity, or the proposed new departure is almost certain to be a foredoomed failure; and in all the old industries the division of labor has been carried to the minutest detail, to obtain the greatest perfection in the work and the utmost economy of production. General intelligence is an excellent qualification, a mind disciplined to perceive things luminously and reason logically is of high abstract value, but in trying to obtain employment the question will be, What can you do? It does not so much matter what line of business or avocation one chooses, but the doing of more and better work therein than another matters everything. The humbler the employment, entered into with the right spirit, the more rapid as well as the more certain will be the advancement. The foundations are thus deeply laid, which, with energy and right direction, will never fail to support a solid growth.

We are constantly in receipt of letters asking advice for young men wishing to start in life in some trade or profession, but who are unwilling to do that which lies before and all around them at their hands. In most such cases it is impossible to give anything but the most general opinion, as the personal equation forms so large a factor in the problem, but there is no place in this country where one cannot put his hands to something. Do what you can, whether it is to your fancy or not—anything in preference to remaining idle—and make it the stepping stone for something better. Training, skill, special knowledge, are only acquired by hard work, but the resolution which fails before a humble task not to one's liking is hardly to be counted upon to meet the more exacting calls of a higher responsibility, and those who are wanting in the energy to do, and do earnestly, what is before them, would probably be found very illy fitted for the higher places they would like if the latter could be had simply for the asking.

Miscellaneous Notes.

Smokeless powder and the results of its use in the battles of the future are being much discussed by military men. An enemy not concealed behind works will, there is reason to believe, be under considerable disadvantage with no smoke to cover him. Especially is this likely to be the case now that the quick-firing heavy gun has been perfected. During the tests recently made at the Colt factory at Hartford the newly improved Driggs-Schroder rapid-fire gun sent a quick succession of eight-pound projectiles with unerring aim at a target four miles away. With the advance of cavalry not covered by the smoke of infantry fire till at least near to striking distance, the quick-fire gun is likely to do some terrible work, if not to make such cavalry advances altogether impracticable. Troops operating in the smoke of their own guns can often see across a field to the enemy while he cannot see them, as we can often see out of an enveloping fog bank which those at a distance cannot penetrate. Thus it is a serious question whether the use of smokeless powder by an enemy would not incline to his disadvantage, his adversary meantime being protected by a film of smoke.

The modern warship has powerful engines, but she cannot make speed, that is to say, for any distance. Compared with her engine possibilities, her coal-carrying capacity is ludicrously small. The fact is notorious on the other side of the water, and we have had recently abundant proof of it. This will account for the untiring efforts of the British Admiralty to secure a means of feeding petroleum or petroleum refuse to marine furnaces. This type of fuel, it has been found, though requiring quite as much room as the present coal bunkers, will drive the ship at least twice the distance, and it is hoped to make it yield three times as much engine-driving energy as its displacement of coal. Another highly important attribute of oil fuel is that it requires few stokers, and being to a large extent an automatic feeder, high temperatures could be maintained in furnace and boiler rooms, to the great advantage of steam making and yet without danger to life.

Considerable success is said to be attending a series of tests now being made in the navy with a new electrical code of night signals. Heretofore signals have been transmitted at night by passing a white light to the right and left over a fixed red light, the letters being formed by various combinations of the figures 1 and 2, the first being represented by the right hand and the second by the left hand movement. Unless the reader of such signals is at right angles to the line on which they are made, there is some confusion. In the present three incandescent lights are employed, red, white, and green, the same being each of 16-candle power and fitted in a vertical line on a jackstay. An ordinary telegraph key is used to show or shut them off, following the Morse system. The green light means a dash, the red a dot, the white for a space, and all three for the end of a word. For day signaling the ordinary wigwag system of two flags, a black to show against the sky and a white against the land, will be retained.

Anti-Fouling Lacquer for Ships' Bottoms.

The United States Navy Department at Washington has recently received from a lacquer manufacturer of Tokio, Japan, two plates of iron and steel respectively, each four feet square and covered with three coats of anti-corrosive and three coats of anti-fouling lacquers. These plates have been submerged in tidewater at the New York navy yard, where they will remain for three months. It is said that the Japanese navy has met with success in the use of lacquer as a protection to the hull of an iron ship, instead of paint, and an official recently returned reports very favorably on the subject. He is said to have seen a vessel on which it had been used, and whose bottom had not been cleaned in nine months, while "the lacquer was perfectly smooth and unbroken, and had afforded complete protection to the metal." The result of the tests of these plates will be awaited with much interest.

ONLY one year ago 90 per cent of the total trade of the Spanish Americas was controlled by European countries. They still have 80 per cent of it, but they are fast losing their hold and the United States is edging in. The best evidence of this is that half of the intelligent people of Mexico are studying English, while many of our people are studying Spanish. Americans are starting stores and even factories in Mexico right along, and with wise legislation to help us we will soon have that trade under our control. The Spanish edition of the SCIENTIFIC AMERICAN is an excellent medium through which merchants and manufacturers of every kind of goods can reach the best class of business people among the Spanish-speaking people of South America, Cuba, and Mexico.

Monolithic Construction.

The buildings of the Stanford University at Palo Alto, California, have attracted wide attention by reason of their novelty, being modeled after the low, adobe, tile roof, mission buildings of the Spanish-American period. They are of stone, massive and necessarily expensive, though of great durability.

A new and striking departure is to be made in the construction of the museum, which, next to the memorial chapel, will be the most important edifice on the grounds; this building, some 300 feet in length and 50 in width, with two wings, will be three stories in height, and the entire structure from foundation up —walls, floors, and roof—is to be of concrete and twisted iron; the whole edifice to be moulded into a single monolithic structure, without seam, break, or joint.

The floors and roof will not be as massive as might be supposed, though possessed of great supporting strength. The bars of twisted iron, embedded in the mass of concrete, are immovably held at every point by the enveloping material, and thus impart their own tensile strength to the concrete, which obviates the necessity for great thickness or heavy weight, especially since it is found that bars of iron subjected to cold twisting gain largely in tensile strength by the process.

As with most simple but ingenious devices, the natural inquiry is, Why was not this mode of construction thought of before, permitting, as it does, the use of concrete where great tensile strength is required?

In the Academy of Sciences, San Francisco, these floors have projections over the central area of three feet or more, sustaining a railing and passageway for visitors, with no support beyond that of the embedded twisted bars.

There would seem to be no good reason why this method should not be widely used for fireproof buildings. The cost is found to be less than that of brick with steel beams, while the security and durability of concrete structures—if properly built—admit of no doubt.

Grate Areas.

There is no doubt that at the present time we are passing through a transition stage in all that relates to the burning of coal in locomotives. This change was introduced with the adoption of the extended front end with its straight, open stack. The abolition of cones and nettings above the exhaust nozzles allowed the use of larger openings and a slower draught upon the fire. The use in many cases of the Belpaire style of box above the frames, with its large grate area, has further increased the proportion of grate area to cylinder volume, and decreased correspondingly the depth of fire which was carried.

There are several points involved in the most economical and successful use of ordinary soft coals under these new conditions which are often not sufficiently considered. The first of these is the depth of fire that can be carried. Comparatively recent writers have commented upon the relative depth of fire that should be carried for hard and soft coal. It was formerly generally conceded that hard coal was best fired when from 6 to 15 inches in depth, while a soft fire should be carried at a depth of from 15 to 24 inches. This relation might be, and probably was, proper in the days of sharp exhausts, but with the softer blast now used it would be impossible to get a sufficient amount of air through the fire, and a thinner fire is consequently necessary. It is also a question whether we have got as far in the direction of a soft exhaust as we shall soon. Experiments with the compound engines already built seem to show that a better average performance as regards evaporation can be got with the slower blast which comes from the low pressure cylinders than with the sharper blast of the ordinary engine.

Another feature, to which more attention should be paid, is the area of air passages through the grates. The fact is too often lost sight of that the grate is merely a vehicle for carrying the fuel, and not the essential feature in the actual combustion. The object should be to have as little of it as can be done without letting the fire drop through, which latter condition has the double disadvantage of making large openings for bodies of cold air to pass through, and by filling up the ash pan allowing the grates to burn out. Smaller and more numerous openings between the fingers of the grates would obviate this difficulty. By having as free an air current as possible, with the openings approaching the neighborhood of 50 per cent of the total grate area, we can work with the slowest possible draught and a light fire. In fact, a light fire must accompany a slow draught to make any air pass through the coals. Another advantage from the slow draught is that with it the temperature immediately above the grates will not be as high, and there will be less danger of the formation of clinkers, which are so troublesome in sticking the grates. This lower temperature at the grates will make no difference in the temperature of the burning gases driven from the top of the coal. Another advantage from the slow draught is that the products of combustion passing through the tubes will give up a greater portion of their heat, and a higher evaporation per pound of coal will be reached.

The ratio of grate surface to cylinder volume is one that will be larger under these new conditions. We have seen in the past, upon one road, and in engines of different classes built at the same time, grate areas varying from 4½ to 7¼ feet to the cubic foot of cylinder capacity. The larger figure will be nearer that required in the future.

One direction in which we may have improvement in working our engines is in the character of coal used. Soft coal crushed into pieces of uniform size, well screened, gives much better results upon a fire than when broken by the fireman. It is of the right size to burn well, is free from either dust, large lumps, or impurities, and while allowing a thin fire, the air is divided into minute streams while passing through the burning fuel, so that the highest result is obtained. This crushing can be done at a small expense, and there is a good market for the increased proportion of slack or nut coal caused by such treatment.—*Railway Mechanic.*

Electricity a Factor in Capital.

"No enterprise in the world," said a well known electrician, "has increased within the last few years as rapidly as the business of electric lighting. The amount of money invested in electric light plants in this country to-day is $120,000,000, and it was only eleven years ago, you remember, that the light was first perfected. From the few lamps burned by Edison at Menlo Park, in 1879, there have grown into present use at least 125,000 arc lights and 1,700,000 incandescent lights."

One of the most noticeable results of this remarkable growth, says *Electric Power*, is the increase in the price of platinum. Here is an incandescent lamp. You see the short strip of wire attached to the copper conductor just at the top of the globe. Well, that is platinum. It connects the carbonized loop, and is one of the absolutely indispensable features of the lamp, because it expands at the same temperature and in the same proportion as the glass globe. There have been a good many experiments for the purpose of determining a substitute for platinum, but none has been found, the experiments resulting in each instance in the unequal expansion of the metal and the glass, and the consequent breaking of the globe. Unfortunately, every lamp requires a strip of this metal. I say "unfortunately" because it has come to be extremely valuable, and the mines are not productive. Moreover, they are situated in the Ural Mountains and are practically inaccessible. As a result of this increasing demand and diminishing supply, the price of platinum has advanced tremendously; it is now almost as valuable as gold. Five years ago the metal was seldom used in this country, being employed only in the evaporating stills for the concentration of sulphuric acid and in the manufacture of jewelry. It was then to be bought in the market for $3 and $5 an ounce. A year ago it advanced to $8 an ounce, six months ago it had increased to $14, and I see by one of the trade journals that it is now gone up to $20, which is only a few cents less than to-day's gold quotation.

Platinum gets its name from the Spaniards. As early as the sixteenth century it appears to have been noticed that the gold ore in the Spanish mines of Darien included grains of a white metal endowed with the qualities of a noble metal, and yet distinctly different from silver. Its exportation to Europe was prohibited, because the Spanish government found that it might easily be used in the adulteration of gold. For this reason it did not find its way to Europe until the middle of the last century, when it was known as "platina del Pinto"—the little silver from the River Pinto. Since its remarkable chemical properties were established in 1780, it has been discovered in New Granada, San Domingo, California, Borneo, and in portions of Canada. But the richest deposits are those in the Ural Mountains, where the metal was discovered in 1823, and where it has been successfully mined by the Russians since 1828.

A Large Export of Heavy Machinery.

The Gates Iron Works, of 50 South Clinton Street, Chicago, builders of rock and ore breaking machinery, recently shipped to Australia eight large rock and ore breakers having a capacity equal to 9,000 tons output per day. Four of these breakers go to the Broken Hill mine, one of the most extensive mines in the world. Upward of $5,000,000 was paid by this mine in dividends last year, and it is claimed that upward of four million tons of ore are now in sight. The other four breakers go to the government of New South Wales, where they will be used in producing rock ballast, etc., along the lines of railroad, which are there owned and operated by the government. As illustrating how easily commercial transactions are carried on with the Antipodes, it is suggestive that in less than sixty days from the time this order was placed by cable, the eight car loads of machinery were on dock in Sydney.

Opals in Washington.

A discovery of opals has recently been made near Moscow, in the State of Washington, close to the Idaho line. A number of the gems have been brought to this city and cut, showing a more brilliant play of colors than those obtained from Mexico. They are whiter and without the yellowish tinge of the Mexican gems. Some of them appear to be harlequin opals, on which the patches of color are made angular and variously tinted but evenly distributed. Others show deep green flashes of color, like those called lechosos by the Mexicans. One, a very large specimen, has been examined by a very skillful lapidary, and other competent parties, who are of opinion that it was the largest and most valuable precious opal in the rough that has been brought to this city.

The recent find was made in a wheat field where men were digging a well, and at a depth of four feet they came upon this deposit. Specimens have been shown to us by Melville Attwood of this city. Specimens of basalt wacke, the inclosing rock or matrix of the opal, came with the gems. Mr. Attwood has prepared a section of the matrix for microscopic examination, by which he identified the substance.

No special work has been done on the claim this winter, owing to the snow, so that the extent of the deposit is unknown. Some of the gems are quite large and pure; and, in fact, all of them are of very good quality and quite handsome, excelling in beauty and luster those from Mexico.

Most of the opals come from Hungary, Honduras, Mexico, and Queensland. Those from Hungary are the finest and most valuable. The Honduras mines are little worked, and the opals seldom reach the market. The opals of Mexico are well known throughout the world, although they do not rank in value or durability with those from Hungary.

It is not generally known that there are several places in the United States where opals have been found, most of them, however, small, colorless, and of little value as gems. Mr. G. F. Kunz, gem expert of Tiffany & Co., New York, in his recently published work on "Gems and Precious Stones," speaks of opal showing a brilliant play of rainbow colors, either of the noble or fine opal variety, having been observed in the United States only, near John Day River, Crook County, Oregon. The specimen found there is transparent, grayish-white in color, with red, green, and yellow flames. The play of colors equals in beauty any Mexican material, and it is the first opal found in the United States that exhibits color.

Mr. Kunz says that this strikingly resembles and has the absorptive properties of tabasheer, the variety of opal which is formed in the joints of the bamboo and which is used in India for medicinal purposes. "Undoubtedly," he says, "better material of the same kind exists where this is found."

A beautiful fire opal without any opalescence occurs in a small vein about one-fourth inch thick and two inches square from Washington Co., Ga. Common opal in small masses of greenish and yellowish white color, with vitreous luster, are found at Cornwall, Pa., also at Aguas Calientes, Gibson Gulch, Idaho Springs, Colorado, of a brownish color.

Professor William P. Blake, in his catalogue of California minerals (1866), wrote of a rich white variety of opal found at Mokelumne Hill, Calaveras Co., Cal., and on Stockton Hill, Chile gulch, opals were found in a thin stratum of red gravel at a depth of 345 feet. These stones were thought to have a market value, but really had none. A milky white variety similar to these and without fire is found 30 miles south of Mt. Diablo, Contra Costa Co., also in the foothills of the Sierra at the Four Creeks.

Nothing however with the opalescent luster and fire of these Washington opals has, as far as we are informed, been found before in the United States. As to the extent of the deposit, that is yet to be determined.

Opal is a native amorphous hydrated silica, the same mineral as quartz with the addition of six or seven per cent of water. It is never found in a crystallized form, occurring in masses having a conchoidal fracture. It has a vitreous luster, sometimes inclining to resinous or pearly, and white, green, yellow-brown or gray color, according to the foreign substances present. Hardness, 5·5–6·5; specific gravity, 1·9–2·3.

The varieties of opal are distinguished according to their color and other physical properties. Precious or noble opal, like the Washington, is generally white or colorless and exhibits a rich play of colors—green, red, blue and yellow, of various shades. When large and exhibiting its iridescence in perfection, it is a very valuable gem. Fire opal is a transparent opal colored hyacinth red to honey and wine yellow by ferric oxide; occurs at Zimapan, in Mexico. The common opal is of various colors, but without iridescence. The formation of opals is due to the solubility of amorphous silica in water, especially in hot water, containing carbonic acid, the silica being dissolved out by spring waters from decomposed silicates and deposited under favorable circumstances in a state more or less approaching to purity.—*Min. and Sci. Press.*