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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 502,

For the Week Ending August 15, 1885.

Price 10 cents. For sale by all newsdealers.

NATURAL GAS WELLS IN OHIO.

Drilling for gas was begun at the town of Madison, Ohio, by Messrs. Gunning and Sond on the 29th of June, and by the 14th of July the well had reached a depth of 780 feet. At this point a heavy vein of gas was struck. The well was continued down to 1,025 feet, about 200 feet of the distance requiring tubing on account of the influx of salt water. The pressure gauge at the mouth of the well registered 100 pounds. The parties named are now supplied with fuel and light.

The great value of natural gas has already been demonstrated at Pittsburg and neighboring places. So rapidly and completely has the substitution of gas for coal taken place, that the principal mills of Pittsburg are now using the new fuel. Oil in the days of the great excitement did not attract such broad attention as has the natural gas in the last year or so, and the wonder now is why we have never used it before. The area of its distribution is probably as large and almost coincident with that of petroleum. We know with a degree of certainty prompted by its commercial importance that our supply of petroleum comes from the rocks of the Devonian, which immediately underlie the productive coal measures, and it will be a matter of much interest to follow the development of natural gas, and note the order of production which the different States and Territories will assume. Of the petroleum producing States, Pennsylvania of course ranks first, then comes New York, and then California. These are followed by West Virginia, Ohio, and Kentucky. In the Rocky Mountain country, Wyoming, Colorado, and New Mexico have been found to yield some small quantities of the oil, but those regions have as yet been only imperfectly exploited. Of the wells opened over this large territory, many were *blowing* wells, and carried with them a large amount of gas, but there was no constancy in this respect, and no particular area could be pointed out as productive of gas above the rest. The whole subject is too new for any complete knowledge of the distribution of the natural gas, but so far as the point has been determined, our assumption of its general coincidence with the oil country seems to be justified. Whether, however, the same quantitative order that we have named for petroleum will follow in the case of the new fuel is still a question. As every one knows, it is already largely used in Pennsylvania and to some extent in Ohio, West Virginia, and other places.

Unless we regard the earth as a vast reservoir stored with gas, somewhat after the order of the Pintsch system of compression, we must contemplate a time when this fuel supply will become exhausted, and abandoned pipe lines will tell the same story as the decaying oil derricks. But the past of our industrial progress is a promise for the future; and we may feel with confidence that as the candle gave way to whale oil, whale oil to petroleum, petroleum to gas, and gas to electricity, so, with our fuel, that natural gas will disappear, only to make room for something still better.

SHALL OUR CANALS BE MAINTAINED?

The question of the maintenance of American canals is just now exciting a very lively interest, and not a little argument is being expended upon the advisability of their improvement and extension. The scheme for making the Erie a ship canal is particularly under discussion. A number of prominent people in New York city and throughout the State have taken preliminary steps to form an organization to promote the improvement of the New York canals. These gentlemen have called a conference, to be held in the city of Utica on August 19. The chief exponent of their views so far brought forward is the Hon. Horatio Seymour, who, in a letter of some length, has formally stated the reasons which should induce the maintenance of the canals. The document in question contains many facts of statistical interest, but to us they indicate different conclusions from those drawn by the honorable gentleman. Any remarkable development, such as that which has taken place all over the United States during the several past decades, presents a very tempting field for analysis; one wants to discover the specific causes for such prosperity, and, having reached them, to give them a wider prevalence. The motive is certainly most commendable, but its proper development requires a nice judgment.

It is a large statement to make, as does the gentleman named, that the prosperity of New York State, as well as the Union at large, is almost entirely the result of the Erie Canal. No one denies that the Erie Canal has been an important factor in our development, and on some grounds its maintenance, as well as that of the other main arteries of our water routes, may be desirable, but the cause is not helped by draping it with too much beneficence. It was admittedly good, but it was not supreme.

Such remarkable progress as it has been our good fortune to enjoy is the resultant of such a host of elements that it is quite impossible to lay hold of one, even though it be among the chief, and with any propriety ascribe to it the merit of the whole. Nor, indeed, would the fact of its predominance in bringing about so desirable a result be a strong argument for its continuance, since the achievements of one generation are the stepping-stones and not the models for the next. The question would seem more aptly to turn on what the canal system is accomplishing for us now, and what it can do for us in the future.

The West is at present the theater of action from which we may draw many a just conclusion, and the fact that the canal is there seldom thought of, even in localities where a network of irrigating ditches is an essential feature, and could with comparative ease be made the basis for an extended series of water routes, is certainly not an indication of the interchangeability of railroad and canal. There are unmistakable signs abroad that the canal is something savoring more of the past than the future. Bands of steel seem a more fitting accompaniment of telegraph and telephone than do those sluggish, malarial water courses. It seldom happens that when two systems are in operation side by side, the one best adapted to our needs languishes, drops behind in the race, and is finally almost out of sight, while its less deserving rival expands with a growth that is almost magical. Yet such, we are told by the canal advocates, is the case between these two rival systems of transportation, even though the comparison is further emphasized by the fact that the present laggard had decidedly the best start. But there are many found who cannot agree to the statement, for there is a growing belief in the survival of the fittest in things mechanical as well as physical.

There is one argument brought forward in favor of the system, however, which may be deserving of attention. In these days of railroad coalitions, through freight pools and various forms of transportation combinations, it might be a wholesome check to have railroad directors remember that if their freight rates became too outrageous, recourse could be had to the canal for those more bulky goods whose indestructibility would survive a two-miles-an-hour rate of travel. To somewhat stretch a metaphor, the canal could assume in trade circles the airy position of the sword of Damocles, ever ready to descend upon the head of a too grasping railroad official.

The question of transportation is in the present day such a large one, and economical competition so close, that it is easy to reach the facts in the matter, without having to turn even to those unequivocal signs of growth and decay. The comparative cost between canal and railroad has more than once been discussed by such impartial bodies as the American Society of Civil Engineers, and their conclusions have certainly not been in favor of the former system. At the last convention of the Society, Mr. E. L. Corthell discussed the question at some length, and his arguments were conclusively on the side of the more progressive method. The inconvenience of the want of speed on a canal is one which it seems impossible to overcome, without an increased expenditure of power out of all proportion to the result. Experiments made on the traction power necessary to move canal boats at various speeds show that while the power necessary to move one ton is only 2½ pounds when the speed is 2½ miles an hour, it becomes 7 to 11 pounds at 4 miles, and reaches the enormous expenditure of 20 to 30 pounds when the speed attains the modest rate of 5 miles an hour. From this it follows that an economical speed must be only about 2 to 2½ miles. On the Erie Canal it is even less. The freight steamers make 40 miles in 24 hours. Professor Barlow's calculation, that the power required by canal boats varies as the *cube of the velocity*, is not in excess of the truth. The cause of this great resistance is due to the confined channel of a canal, where the "carrier" wave, which advances before the vessel, offers a continually opposing current to its progress, and is at the same time very destructive to the banks.

There are of course many classes of merchandise which, in spite of the want of speed, would still be carried by the canals, could they do so at any advantage over the railroads; but when it is shown, as Mr. Corthell has demonstrated, that in addition to all their other merits, railroads are the cheaper carrier of the two, there seems absolutely nothing to be said in favor of the canal. In England, in Canada, and in the United States, the experience has been the same. It is manifest that the canal cannot hold out against the railroad. Capital once expended in building a canal is devoted to the purpose forever, and if therefore we admit that it is lost, and in consequence omit all interest on the investment from our table of expense, there are localities where the canal can compete with the railway; but even under these circumstances the competition is fast narrowing, and with interest added to other expenditures, the railways will still be the winners. In the face of these facts, the wisdom of maintaining the system is even open to some doubt. The plan for its extension is certainly to be discouraged.

General Annenkoff proposes a sea canal from the Caspian into Michael's Bay, to render transshipment from deep into light draught vessels unnecessary. Such a work will greatly facilitate transport over the Caspian.

The Beginning of the Patent Office.

In the second volume of McMaster's "History of the People of the United States," recently reviewed in the SCIENTIFIC AMERICAN, we find the following interesting historical particulars concerning the American Patent Office:

"While one part of the community was expending its ingenuity in adding new words and phrases to our tongue, the ingenuity of another part was rapidly adding to that splendid series of inventions and discoveries which no American should contemplate without feelings of peculiar pride. The United States patent system had begun.

"The glory of it belongs to Jefferson. He inspired it, and long took so deep an interest in its workings that he may well be called the founder of the American Patent Office. The growth of it is marvelous. To one who wanders through the corridors of that magnificent building and beholds the army of clerks and draughtsmen, and the hundreds of thousands of models there displayed, it seems scarcely to be believed that when 1800 came one man did all the clerical labor, and a dozen pigeon-holes held all the records of the office. For each of the patents which then existed a thousand have since been issued; nor does it seem too much to say that before 1900 shall have been reached this ratio will have been increased two-fold.

"The law of April 10, 1790, established the office, made the Secretary of Sate, the Secretary of War, and the Attorney-General a board of commissioners, and bade them examine the claims of inventors and grant patents to the deserving.

"So rigorously did the board construe the law that, in 1790, but three were issued. In 1791 the number rose to thirty-three. The next year it fell to eleven.

"In 1793, when Jefferson went out of office, twenty were sealed. The moment a claim came into the Department of State, Jefferson would summon Knox and Randolph. The three would meet, go over the application most critically, and scrutinize each point of the specification with the utmost care.

"If they threw out the claim, the decision was final.

"The inventor had no appeal.

"If they determined that a patent should issue, the paper was signed by the President and the Attorney-General, and the inventor paid down a small fee.

"For receiving and filing the petition, fifty cents; for filing specifications, ten cents the hundred words; for making out the patent, two dollars; for affixing the great seal, one dollar; for indorsing the day of delivery, twenty cents.

"It was a long document, for which the patentee was charged four dollars and a half.

"But the men whose clumsy machines and crude devices had been thrown out raised a great clamor.

"The power of the board was too great.

"It was outrageous that their decision should be final. There ought to be an appeal. Jefferson combated this, but the cry was heard. The law of 1790 was revised in 1793, and revised for the worse. The duty of granting patents was lodged with the Secretary of State alone. He was forbidden to reject any application not likely to be hurtful to the interests of the people, and the cost of patents was greatly increased. For forty-three years this law continued in force. Then the evils which grew up under it became so rank that Congress was again forced to interfere. Five months later, December 15, 1836, the Post Office building was burned to the ground.

"With it went the seven thousand models of the Patent Office, by far the noblest collection the world could then show. When the next fire occurred, forty-one years after, the Patent Office had obtained a building of its own, and the seven thousand models of 1836 had become two hundred thousand in 1877. It is deeply to be lamented that, of the many thousands destroyed in 1836, so few have ever been replaced. Not even a complete list of them can now be had. Yet, most happily, it is not impossible to form from the fragments of information gathered elsewhere some conception of the ingenuity of our countrymen.

"One had invented a grain cutter, a dock cleaner, and a threshing machine. No precise account of his work has come down to us. But we are told that with his reaper one man could cut five acres of wheat a day, and that his thresher could easily beat out as much grain in twelve hours as forty men. Another had devised and put up a water mill for roping and spinning combed wool and flax. A third had invented a candle machine, had made candles from the lees of the right whale, and had seen his work displayed and warmly praised in a long memoir by the President of the Agricultural Society of New York. A fourth had discovered a way of turning iron into steel. A fifth had incased himself in a strange apparatus, had surprised the fishermen of New London by going down in four fathoms of water, had walked upon the bottom, and had come up after being three minutes in the sea. A sixth took out a patent for a machine which has made his name famous ever since.

"The inventor was Whitney, and the machine he called a cotton gin."

Chrome Iron and Steel.

A boring tool of chrome steel, if properly proportioned, will stand to bore and turn cast iron that is too obdurate to yield to the persuasions of the best tempered and "highest" crucible steel cemented from bars of the best iron. A large fly wheel for a special purpose, with a narrow rim, and thirty-two feet in diameter, was found to be so hard on the face of the rim that it could not be turned. Much fuss was made to induce the obdurate rim to yield, but to no purpose. Grinding was attempted, and chipping, but the outer surface was like glass. Tools of chrome steel finally induced the iron to yield, and a costly casting was saved.

The chromate of iron, commonly called "chrome iron ore," is found in Maryland and in Pennsylvania. The bichromate of potash is made by heating chrome iron ore with one-fourth its weight of nitrate of potash (niter) and then digesting it with water. Chromeisen (chrome iron) is a compound of about three parts by weight of chromium and one of iron. It is hard enough to cut glass readily. Chrome steel has a larger proportion of iron. Both are used in the construction of burglar proof safes. Chrome steel may be made quite ductile and soft by using chromeisen instead of spiegeleisen in the Siemens steel process, when the resultant can be tempered to several grades of hardness within well defined limits. Chrome steel is useful for many jobs in the machine shop, and should be more generally employed.

Astronomical Notes.

Sun Spots.—The maximum of sun spot activity probably passed in the latter part of the year 1883. But solar physics are not regulated with line and plummet like terrestrial mathematics, and solar changes occur like dissolving views, where one phase glides into another by an imperceptible process. There are still spots on the sun's face, as any observer may see who has access to a small telescope. During a recent observation, made with a three inch refractor, we saw on one day six, and on another day nine of these little black patches on the shining orb. They were of all sizes from large pin heads to points, and some of them must have covered many thousand miles in area.

A remarkable event occurred on the 11th of June, notwithstanding the decrease of solar activity. Two spots were then visible to the naked eye. They were seen by observers in different parts of Europe, and were carefully watched during their continuance.

Those who study the changes on the solar disk will find, that year after year, with some exceptions, the spots will lessen in number and size until about 1889, when the sun will be nearly free from these unsightly blemishes. The spots will then slowly increase until about 1893, when the maximum is reached, and continues for two or three years. The sun spot period therefore embraces about eleven years. It is irregular and ill-defined, and the wisest scientist has thus far been unable to give a satisfactory reason for its occurrence.

Markings on Jupiter.—A famous red spot made its appearance on the planet Jupiter in 1878. It continued to be the observed of all observers for five years, when it gave signs of passing away.

Mr. Denning, of Bristol, who makes a specialty of watching the changes on the face of the giant of the system, announces that the spot has been growing much darker and more conspicuous during the last few months. He thinks it highly probable that the red spot may resume its former importance in the opposition of 1886. This indefatigable observer has been searching the archives for records of Jovian spots observed in former times. His efforts have been successful. In the records of 1843, a note book of the Rev. Mr. Key was found, containing a view of Jupiter with the dark belts admirably drawn, and between them, in stronger black color, a long oval spot, of precisely the same shape and size as the red spot that attracted so much attention. Mr. Denning also found that a large black spot was observed on Jupiter in 1843 by Mr. Dawes. Hence he is led to believe that the spot seen by two observers in 1843 is identical with that of 1878, and, if so, must represent some permanent feature on the planet.

Photographing the Stars.—The Messrs. Henry, of the Paris Observatory, have an apparatus specially prepared for photographing the heavenly bodies. M. Mouchez, the Director of the Observatory, has presented to the Paris Academy of Sciences a chart obtained by this method and executed by these skilled astronomers. It contains a small section of the Milky Way, and presents to view about 5,000 stars ranging from the sixth to the fifteenth magnitude.

There are 41,000 superficial degrees in the firmament. A representation of the whole surface completed in the same way would require 6,000 similar sections, forming 1,500 ecliptical charts. Gigantic as such a work appears, it is estimated that if it were undertaken by six or eight observatories, favorably situated in the two hemispheres, the work might be concluded in five or six years. Such a work would contain the photographs of 20,000,000 stars down to the fourteenth and fifteenth magnitudes. It would be a priceless contribution to the astronomy of the future; presenting an exact picture of the starry heavens at the close of the nineteenth century. The undertaking would rank as the greatest on astronomical records, and implies an amount of work sorely taxing human power. But there are active brains and willing hands among the astronomers of the day, whom difficulties will not deter. We have faith to believe that the century will not close before the starry firmament as it now exists is pictured by the wonder-working photograph, and made immortal for the use of the generations that succeed us.

Comet α, 1885.—The eighth month of the year is on the wane, and thus far but one comet has illustrated its annals. Professor Barnard, of Nashville, Tenn., was the winner of the celestial prize. He discovered on the evening of the 7th of July a small comet in Ophiuchus, its position being at that time in right ascension 17 h. 21 m., and in declination 4° 57′ south. The comet is described as being of the eleventh magnitude, having some central condensation, but no tail. It is moving south, and will soon be lost to view, even in the large telescopes. The small visitor has received great attention from observers without, however, any noteworthy results.

Sorghum Sugar in Kansas and New Jersey.

The Governor of Kansas, in his annual message, said: "There are now three sugar factories in the State, located at Sterling, Hutchinson, and Ottawa, and they produced last year 602,000 pounds of sugar. . . . This product was manufactured from 19,300 tons of sorghum cane." By an easy calculation, we find that the average yield of sugar, per ton, was 31 pounds, representing less than 1½ per cent of the cane worked.

The average for several hundred German beet sugar factories during 1884 was over 200 pounds sugar per ton, or a yield of 10 per cent on the total roots worked. Comments are unnecessary; these figures speak for themselves.

We have previously frequently called attention to the Rio Grande sugar factory of New Jersey. While several hundred thousand pounds of sorghum sugar have been annually extracted from the sorghum stalk, the average yield was only about 1½ per cent. A bounty was granted by the State on every pound of sugar made. The prospects for coming years are less encouraging than in the past. The bounty soon ends; and nearly all the hogs fed upon the refuse have died from some unfortunate disease. What is to be the ultimate utilization of this plant, upon the growing of which several hundred thousands of dollars have been spent, time alone can decide.

We have doubts as to the continuance of sorghum sugar manufacture after 1886. There might be here a nucleus for a beet sugar factory—in all cases the question is worthy of consideration.

We were much amused some time since, in reading an account of a speech of a would-be sorghum sugar manufacturer. He demands that all *beet sugar* entering this country be declared worthless, it containing a parasite of a most objectionable character. This absurd and wicked proposition is supposed to be a retaliation for the German attack on American pork.

The truth, however, is that hundreds of sorghum growers now commence to realize that the great Northern sugar producer of the future is the beet, and not the sorghum cane, as they have hitherto contended. In their moments of despair they wish to suppress the entire beet sugar importation, forgetting the distressing effect of the competition of the colonial cane-sugar.

We, on the other hand, would prefer a high tariff and encouragement of the Southern sugar interest. If beet sugar enters our ports in preference to cane sugar, and is consumed by our people, it is one step toward convincing the community that beet sugar is a realizable fact, and that it will possibly prove a great savior of our nation.—*Sugar Beet.*

Temperature of the Earth.

The London *Times* says the German Government is having a deep shaft sunk near Schladebach, with the object especially of obtaining trustworthy data concerning the rate of increase of the earth's temperature toward the interior. At the beginning of this year the shaft had reached the depth of 1,392 meters, which is believed to be lowest yet reached. The temperature at successive stages is ascertained by a special thermometer, the principle of construction being that as the heat increases the mercury will expand so as to flow over the lip of an open tube. The difference of the overflows will give the rate of increase of the temperature. It has been ascertained that the temperature at the depth of 1,392 meters was 49 deg. Centigrade, or 120 deg. Fahrenheit. If the temperature increases regularly at this rate, the boiling point of water ought to be reached at a depth of 3,000 meters, or nearly two miles, and at 45 miles we should find the heat at which platinum melts. This would go to show that the earth's crust cannot be more than about one-ninetieth of its radius.