Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year, postage included.....$3 20
One copy, six months, postage included..... 1 60

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Over ten copies, same rate each, postage included..... 2 70

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VOLUME XXXIV., No. 9. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, FEBRUARY 26, 1876.

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(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 9.

For the Week ending February 26, 1876.

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The SCIENTIFIC AMERICAN SUPPLEMENT is uniform in size with the SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

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WHAT THE COMING MAN MAY BE.

Clever writers have frequently amused themselves and their readers by forecasting the future, and prognosticating the condition of humanity centuries hence. They have materialized, so to speak, the dreams of to-day, and pictured human life as it might be were those dreams fulfilled. In all these Utopias, however, the people, though better morally, more happy socially, more fortunate politically, and more powerful through easily predicted increase of knowledge, are yet substantially the same as the people of the present. It is assumed, apparently, that the future progress of man is to be measured by changes in his condition, not by changes in himself: that, supposing progress to go on in the future as in the past, the men of 5876 will differ from us in their personal development.

A writer of sufficient knowledge and liveliness of imagination might plan a more marvelous and, it is hardly too much to say, more probable Utopia from the standpoint of psychical rather than material development, picturing a time when the average man will be intellectually as superior to us as we are superior to the less developed man of five thousand years ago. That there has been a similar increase of human brain power during the past few thousand years is as certain as that there was a steady increase of brain bulk throughout the animal kingdom during the geological ages just preceding; and there is no physiological or other reason for believing that man may not go on perpetually increasing in mental power.

Measure the intellectual gulf between the Australian savage, barely able to count his fingers and having no numerals above two, and a Newton or a La Place, or even the average man of to-day: then suppose the whole race advanced an equal interval. Imagine a race of men so intellectual that the average man would be a Michael Angelo! The basis for such an estimate of the powers of the coming man is found, strange to say, in certain idiots.

Idiocy is commonly marked by the non-development of the physical powers, but sometimes by the non-development of all but one, in which cases a single faculty appears to receive the whole of the force evolved, and to develop enormously at the expense of all the rest. Thus we may account for the marvelous power in one direction shown by idiotic prodigies like Blind Tom, whose psychical power is wholly musical. The idiot painter known as Cat Raphael illustrates the same perversion of force in another direction. He drew and painted cats and kittens of every sort, shape, and shade, in every possible position and condition, and painted them wonderfully well, yet could do nothing else. In like manner we have calculating idiots, able to make the most elaborate calculations almost instantly but utterly unable to explain the mental operations involved. Other idiots, without reference to clock or watch, and without conception of the object or meaning of divisions of time, are able to tell the hour and minute at any time, night or day. Still others show an extraordinary development of verbal memory, unaccompanied by other mental power. Though unable to read or to understand the meaning of many words, they will repeat by sound hundreds of verses, lists of words, everything, in short, that they may hear. Then there are historical prodigies, who, though ignorant of history in any just sense, can give the date of every great battle or other event, repeating them as isolated facts, devoid of interest and meaning. Similarly there are mechanical idiots, or rather mechanical geniuses who are idiots in all other directions. A few years ago there was exhibited in England a beautiful model of a ship, pronounced by competent judges to be a perfect specimen of naval architecture, every detail being proportioned and finished with the nicest exactness. It was made by the imbecile son of a gardener in an interior county. Up to that time, it is claimed, he had never seen the sea or a ship, his pattern being a printed ship on an old pocket handkerchief. When his work was nearly finished, he visited a dockyard, and made a few changes in his work. Four years were spent on this, his second attempt at shipbuilding, his first having failed through ignorance of the fact that wood could be bent after immersion in hot water, a trick which he is said to have discovered by himself. He was taught to copy drawings, which he did with surprising exactness; yet after all, at the age of twenty-four he was described as a small headed, large pupilled idiot. So we might go over the whole list of human faculties, finding illustrations of enormous developments of each combined with the total lack or non-development of all other mental powers. The entire force of such individuals seems, as we said, to be turned into a single channel.

Imagine an organism capable of sending an equal amount of force to each and all the faculties: a type of humanity in which the average man should have the memory of some idiots, the swift and certain calculation of others, the linguistic, musical, constructive, and artistic faculties of others. Such a type of man is by no means impossible, by no means improbable. There have been prodigies in memory, in calculation, in music, in inventive power, who were up to the average in all other directions. However excessive the development of their faculties in one direction, it did not greatly impoverish them in the rest. And as, during the milleniums past, the human race has been slowly lifted from the low intellectual level of prehistoric savages, so we may reasonably infer that the race will go on increasing in mental power, until those prophetic hints of what man may be are all achieved and overpassed.

A MAN'S WORK.

How best to utilize human labor, and at the same time to produce the least fatigue, is one of those interesting problems in industrial mechanics which every inventor of machines based on man power as a motor is called upon to consider, and to which every employer of men for the sake of their brute muscular strength is obliged to give some attention. It is a common error to believe that, in order to produce a given amount of work, a man always expends a given amount of power, and to recognize this is the first step toward a correct estimation of a man's muscular capability. Appropriate rests are absolute necessities to the human machine, and it is by intermittent, not continuous, effort that its best work is produced. One man laboring ten hours and taking intervals of repose will produce more force and accomplish more work with less fatigue than another laboring eight hours with shorter or less frequent rests, the actual time spent in working in both cases being equal. But on the other hand, during the periods of absolute work regularity is a necessity, a fact clearly shown by the government of soldiers on long marches, where the drum to which the feet keep time is a wonderful agent for repressing fatigue, simply because it ensures regularity of motion. So also in rowing in a long race experience has proved the advantage of a clockwork regularity of stroke with a brief breathing spell between each pull. In fact it appears that men will naturally fall into this cadence, as witness the blows delivered by laborers with sledge hammers upon rock drills, and the peculiar timed "hup" which each will aspirate as his implement falls, or the tendency which sailors have to break into a cadenced singsong when pulling a standing haul on a rope. A more curious instance in this same regard is found in the power of dancing; nothing but the repeated rests and the regular movements will explain the ability of women, to whom ordinarily a walk of a mile in length is a severe task, to dance during a period of five or six hours, and this at a time when Nature is most exhausted, owing to deprivation of sleep.

The best application a man can make of his power is through his legs, for the muscles of those members are not only absolutely but relatively stronger than those of the arms. In other words, after work, the fatigue produced in both sets of muscles being equal, the leg muscles will have performed more useful labor than those of the arms. And further, the nearer we imitate a natural movement the better do we apply the power, therefore a walking motion of the legs, at a velocity equal to that of an ordinary gait, and applied to levers, is probably the most efficacious application of human force for steady work.

As to the absolute power of a man, expressed in pounds to be lifted or in similar terms, exact data are obviously impossible, even for an average individual. An interesting series of experiments were conducted on this subject some time ago in France, and these, we believe, give a fair approximation. The heaviest load a man of strength can carry for a short distance is placed at 319 pounds. All a man can carry habitually—as a soldier his knapsack—walking on level ground is 132 pounds, and this is an extreme load, we should judge. Or he can carry an aggregate of 1,518 pounds over 3,200 feet as a day's work, under like circumstances. If he ascend ladders or stairs—as do hod carriers—then he can carry but 121 pounds continuously, and his day's work cannot exceed 1,232 pounds raised 3,200 feet high. With regard to the effort and the velocity which a man can produce by pulling or pushing with his arms, it has been found that, under the most favorable circumstances and for continuous work, an effect exceeding from 26·4 to 33 pounds raised from 1·8 to 2·1 feet per second cannot be gained, and this is equal to about ⅛ horse power.

THE OIL RESOURCES OF AFRICA.

It is hardly possible to study the progress which has been made during late years, in the art of utilization of previously wasted substances, without being impressed with the anomalous course which the world has followed, relative to the vast natural products of Africa. To the economist the question may well suggest itself whether an energy and skill akin to that which scientific men have expended in discovering sundry of these utilizing processes, if devoted to devising means for developing the resources of the great and almost unknown continent, would not have yielded results far more valuable to mankind in the increase of raw material placed at its disposal. A striking instance is found by comparing the labor devoted to the extraction of fatty matters and grease of all kinds—labor (including the long voyages of the whaler, the sinking of wells in the oil-bearing earth, and the manifold operations known to chemistry) dependent on countless varying circumstances—with the fact that for miles along the West Coast of Africa, extending between Cape Blanco and St. Paul de Loando, there are vast forests of palms, the oleaginous fruit of which has for centuries rotted unused upon the ground. The palm forests back of the coast line between Cape Palmas and Elmina are said to be practically inexhaustible; and so also, in the neighborhood of Fernando Po, immense tracts are covered with the trees. The total export of the palm oil to England exceeds, it is said, 50,000 tuns, or a value of $10,000,000 per annum; but it will readily be seen that this represents an exceedingly small commerce compared to what might be the case were the enormous resources fully or even moderately utilized. The Fernando Po oil crop, as an example, seldom equals 400 tuns per annum, although 4,000 might easily be produced.

The difficulties in the way of the development above indicated are the unhealthiness of the country, and the monopolies controlled by slave dealers. One of the latter buys the entire right to a large and valuable region by paying the King of Dahomey $10,000 a year. The iniquity of this monopoly is increased, says a recent writer, by the king binding all he traders to give palm oil to this trader at a price fixed by this king himself, without reference to market prices. The penalty of non-compliance with the king's command is decapitation. Trade is carried on by the most primitive means. In

Bonny, which is now the greatest palm oil market on the West Coast, the manila, a bronze coin from Birmingham, England, not unlike a bracelet in shape and size, is the current medium for money, in Old Calabar, the currency is copper wire and brass rods, about three feet in length and bent double; on the Guinea coast, gold dust is used, and one tribe uses strips of iron tied up in bundles of eight or ten pieces.

The fruit from which the oil is obtained grows in the form of a large cone, about the size of a man's hat. It is covered with long spines which protect the nuts, the latter being about the size of a large olive and of a deep golden color. The palm tree forests, in the midst of which most of the factories exist, are said to be very picturesque. The trees, which tower to an enormous hight, are as thick as it is possible for them to be, forming in some places large and impassable clumps, and in others opening in wide and tortuous vistas. The trunks are often covered at the lower part with tufts of lovely fern, the emerald green of whose long fronds, as they droop gracefully to the earth, forms a beautiful contrast to the somber brown of the trunks which they ornament. In the open spots in the forests, the factories, mere collections of huts, are built. In Dahomey, the nuts, when gathered, are thrown into a trough formed by marking off a small area about six feet square, beating down the earth to form a floor and enclosing it in a wall about 18 inches high. Into this receptacle the husks are thrown, to be trodden under foot by women until the husks and the oil which exudes together form a kind of putty. The mass is then thrown into vessels of hot water, when the oil rises to the top and is skimmed off. In Fernando Po, it is the practice to let the nuts rest in heaps until almost putrefied; hammering with stones follows, and then simmering of the pulp in a kettle, after which the women squeeze out the oil with their hands. The men do not engage in the manufacture, their labor ending with the climbing of the trees and shaking down of the fruit. It will be observed that the outside of the nut only enters into the process. The kernel separately yields a so-called black oil, and forms the staple of a trade with England, where the hard portion is subjected to the action of powerful crushing machines.

Oil from the palm nut, is, however, by no means the only fatty product to be obtained from rank African vegetation. No one has ever estimated the vast resources of this description, which abound in the countries bordering on the river Niger; and it is only in the shape of experimental and comparatively small exports that we get a glimpse of them. From Senegambia and Guinea come Fouloncuma oil, used by the natives for anointing their bodies, and for burning in lamps, and Galam oil, a natural vegetable butter very much used in Africa for preparing food. The castor oil plant grows wild with great luxuriance in Senegambia; and throughout West Africa there is an immense yield of pea or ground nuts, which already has given rise to a large commerce. In the northern part of the continent and especially Algeria, there are enough olive trees to supply, if fully developed, the demand of all Europe. The province of Kabyle is one enormous olive tree forest. The cocoanut palm grows in immense forests in Zanzibar, where its fruit is exported to France and England, for making stearine for candles. The *trichilia capitata* on the Zambesi produces small black seeds which contain a large quantity of solid fat. The "forna" nut of Central Africa yields an excellent oil for culinary purposes, and is cultivated by the natives. A tree discovered by Dr. Kirk on Lake Nyassa also gives a rich oil, which even the natives have not utilized.

There is no doubt but that in the gradual progression of commercial colonies for the development of the resources we have indicated, the most rapid means for opening up the interior of Africa, will be found. Such expeditions as that of Stanley and of other isolated explorers, though they may add to our knowledge of other resources, do nothing toward their utilization, but rather only show us how great is the task which civilization sooner or latter must accomplish, in overcoming the natural obstacles of a neglected continent.

ANOTHER NEGLECTED INDUSTRY---MUSHROOM RAISING.

We have never been able to understand why mushrooms are such an expensive delicacy in this country. Every variety of the toothsome fungus—even the Italian mushroom, the most delicious of all—grows wild in our pastures or can be raised in our climate with very little care. And yet, those who most use mushrooms, the hotel and restaurant proprietors, buy the French canned goods, save for a short time in the autumn when a small supply of fresh mushrooms are obtainable. French mushrooms cost all the way from 50 cents to $1 for a little can, at retail; and to buy a small basket of fresh mushrooms, even in our large markets, is rather to overtax the average pocket. Still we have picked them by the pailful in Connecticut cow and horse pastures; but the natives looked askance at our eating them; and as to cultivating the "toadstools," the idea to their mind was preposterous.

Now, with all due deference to our excellent farmers who think as above, we venture to affirm that, if a few of them would set about this cultivation on a large scale, and offer the products in the cities, they would find a ready sale, and realize quite a large profit. Occasionally a florist makes a mushroom bed in his greenhouse, and lovers of the delicacy sometimes cultivate it in a small way in their conservatories and cellars; but with the exception of the effort made by the late Professor Blot, that prince of French cooks, who came to this country as a missionary to reform us from dyspepsia-breeding pie and fried meat, we know of no attempt being made here at their cultivation on a commercial scale. The professor built wooden structures under ground, and they decayed; then he grew tired of his project and let it die through neglect, before any of its results, good or bad, could be seen. Near Paris, Blot had seen immense cases, from 20 to 60 feet in depth, filled with musbroom beds, the length of all of which beds together in one year aggregated over 21 miles; and he knew well that often a single building stone quarry, in the excavations of which the beds were located, sent 3,000 pounds of mushrooms daily into the French metropolis. No wonder, then, seeing the utter absence of the fungus from our markets, that he perceived an opening for a lucrative business in its cultivation.

The reader who may wish to try mushroom culture in a small way—which he had best do as a beginning—will find his cellar, if he dwells in the city, or any convenient outhouse, if in the country, a suitable place for a few beds. The material required is horse manure, which must be sweated by gentle and careful fermentation for a week or a fortnight, until most of the rank straw and grass is decomposed. Turn over the mass every two days, and by the end of about a fortnight it will be partially fermented, no longer offensive to smell, and in fact sweet enough to be placed in the cellar of a dwelling. An average depth of a foot or eighteen inches makes a good bed, which should be about a yard wide, with its contents well packed. The shape is immaterial. It is useless for the cultivator to prepare his own spawn, as it can be purchased very cheaply from nurserymen, at from 15 cents to 25 cents a pound. The quality, however, is important. Good spawn can be told by the minute white threads which permeate it in all directions, and these should not be too far developed. A reliable dealer will have the right kind. The spawn is first broken into bits about 1½ inches or so in cubic contents, care being taken that each piece has the white threads running through it. These fragments are planted in the manure at a depth of 3 inches, and placed about 4 inches apart. Then the bed is firmly rammed down with a spade or mallet, and about ten inches of good loam packed hard and smooth on top, the surface lastly being covered with hay or straw. Care should be taken that the cellar or outhouse selected is sufficiently sheltered, so that a constant temperature of from 55° to 60° Fah. is maintained in it. The mushrooms will appear in about six weeks, and the beds will bear for from one to three months, according to the quality of spawn, strength of manure, etc. Water only about once a fortnight and then sparingly; the temperature of the water should not be below 60° Fah.

In plucking the mushrooms pull out the stalk, as, if left, it is liable to decompose and injure succeeding crops. Instead of beds as described, the manure can be packed in boxes or tubs to within 2 or 3 inches of the surface, and loam added above. The difficulty with box culture is, however, that the heat does not remain constant, though this may be compensated for by plunging the boxes up to the rims in decomposing manure during the preliminary stages of the growth within. Mushrooms have been grown well on a warm shelf in a kitchen, and excellent crops have been obtained from beds made on shelves in a stable where the heat of the animals supplied the needed warmth. In summer it is only necessary to make a bed in the coolest and shadiest portion of the garden; this should be covered, to keep it moist and to protect it from the ravages of rats, mice, and snails, all of which will greedily eat the young fungus.

There are some valuable treatises on mushroom culture extant, from which those who contemplate extended cultivation can obtain full instructions. The cultivation, however, is so simple that very little skill is required to conduct it.

Some years ago, the Royal Horticultural Society, in England, made strenuous efforts to popularize the mushroom, and offered prizes for collections of fungi, and gave numbers of excursions and dinners in which the mushroom was substituted for meat. But little success attended these efforts, mainly on account of the difficulty found in distinguishing the genuine and safe mushroom from the dangerous and poisonous fungi, and also on account of a popular prejudice which looks upon any fungus as a mere sign of noisome decay. Of course when raised from reliable spawn, danger from eating the mushrooms is not to be apprehended; but it is unsafe to collect from pastures fungi for edible purposes unless one is familiar with the subject.

CAN WE PROTECT OUR BANK VAULTS?

Seven armed men recently entered the house of the cashier of the Northampton National Bank, at Northampton, Mass., and compelled that officer at the muzzle of the pistol to reveal the combination of his safe vault. Then they bound and gagged him and his entire family of seven persons, quietly waited until the bank's night watchman had departed, opened the vault and safe, and stole $750,000 in cash and securities. The annals of crime can show few more audacious robberies than this, nor do we know of one which has excited a wider spread feeling of insecurity or a more general distrust of all modern burglar-proof devices. Certain it is that no lock, however intricate, is safe so long as the means of opening it is in the hands of any one person; for no man, however brave, can withstand the persuasions of a night attack on his family and of a cold pistol barrel pressed against his temples in order to make him hand over his keys or divulge the information demanded. It may well be asked if seven men can plan and successfully carry out such a scheme, whether twice seven men could not perpetrate even a more gigantic robbery; and when we consider the matter in the light of the elaborate precautions taken by the thieves and their intimate knowledge, which they spend weeks in acquiring, of a marked point of attack (all detailed recently by a convict captured in a similar undertaking), it is but natural at first to doubt the safety of any bank or strong box. But on the other hand, it is reasonably certain that, if the Northampton bank people had been as vigilant as the thieves, the robbery could not have occurred; and it seems to us that, if the means which Science offers for protecting our valuables were fully used, such robberies would be impossible, or at the least be very difficult, of perpetration. Suppose, for instance, a chronometer lock had been in action on the Northamption safe. Then what would have availed the binding and gagging of the family of the unfortunate cashier, and an assault on his person, since he would have been as powerless as the thieves to enter the stronghold? At a certain time next day, when all the employees of the bank would be at their desks, the safe could be opened; until then, if properly made, nobody could stir its doors. Rendering it the duty of two bank officers, one as a check on the other, to assure themselves that that lock was in working order at the last thing before closing the bank for the night, would prevent any tampering with the mechanism; and should the lock be inoperative, the very circumstance would instantly suggest extra vigilance during the night and until the difficulty could be remedied.

Another safeguard is found in never trusting the means of opening the safe to a single individual, a plan frequently adopted in banking institutions in cities. There might be, for instance, three locks to a door; and the key or the combination which throws back each could be in the possession of a different officer, so that no one of the trio could enter alone. This would necessitate the robbers intimidating three persons instead of one. Or the knowledge of a combination might be kept a secret, by the president, for example, and the cashier possess only a key to be used in connection with the combination.

There is much safety to be found in properly constructed electric devices. Why, for example, has not somebody invented a thief catcher—a couple of metal knobs which must necessarily be turned in attempting to open a door? At night, lead a powerful interrupted battery current to those knobs. When the burglar grabs them they will grab him, for he cannot let go, as every one knows who has tried to release the handles of the simple magneto-electric machines from which itinerant scientists at country fairs offer to administer shocks for a penny or two each. The burglar, besides, will get so thorough a shaking that he would convert himself into an alarm, and yell loud enough to awaken any somnolent neighborhood. Electric wires might be laid from every door in the bank to convey an alarm, say to a police station or any other desired point; and if those wires were so placed that cutting them in advance could quickly be told through the breakage of the circuit, tampering with them could be found out in time and proper precautions taken.

It has been suggested that the next advance of the thieves will be a day attack on a bank, through the use of an exploding shell tossed in among the clerks, and a rush for the funds in the confusion. For this, the only remedy appears to be constant watchfulness, or the encasing of the people handling money in a separate armored room, and not dividing them by a mere wood and glass partition from the crowds which often congregate outside the tellers' windows. We have some banks in our mind whose counting rooms are very poorly suited to withstand an attack of the above kind.

We think that there is abundant ingenuity in this country to provide means of frustrating the smartest and most audacious of burglars; and that if inventors will set about it, devices much more efficacious even than those which have occurred to us can be produced. At any rate it is hardly time to suggest the abolition of banks, as does a daily contemporary of this city, and thus admit that we are outwitted by rascals, until we have seen what the inventors can do, and certainly not before we have fairly tried the safeguards with which we are already provided.

REMARKABLE PUMPING ENGINES.

We publish in this week's SCIENTIFIC AMERICAN SUPPLEMENT (No. 9) two pages of engravings illustrative of the remarkable steam pumping machinery, lately completed at Hammersmith, England, by Messrs. Gwynne, for the drainage of the Ferrara Marshes, Northern Italy.

The tract to be drained covers an area of 200 miles. The machinery we allude to is calculated to discharge 456,000 gallons of water per minute, or 656,640,000 gallons per day; being about six times the capacity of the Croton Aqueduct of this city, which is able to deliver 110,000,000 of gallons per day. The water delivered by these remarkable pumps forms a stream 103 feet wide and 4 feet deep, having a speed of two miles an hour; one day's delivery would fill a reservoir one mile square to a depth of 3 feet 9 inches. In view of the completion and successful operation of gigantic and economical machinery like this, the drainage of the Zuyder Zee, in Holland, which is about to be commenced, is rendered a comparatively easy task. The Zuyder Zee area to be drained is 759 square miles. Splendid models of the abovementioned machinery are to be exhibited in the British department of the Centennial Exhibition.

Improved Lantern Galvanometer.

In the arrangement recommended by Professor Nipher, an astatic system of needles is used, supported by silk fiber. The distance between these is four inches, and the system is placed over the lens of a vertical lantern. The image of the lower needle is thrown upon the screen. The upper one is out of focus and is invisible. The needles are deflected by two coils situated on each side of the upper needle, and out of the field of view. The distance between the coils is varied to any desired extent to adapt the instrument to the different currents. The connections are such that the instrument can be instantly used in measuring electrical resistances. The resistance can be diminished in working with the thermo-currents, or increased with ordinary galvanic currents.