haps, to speak more accurately, of the modern aeroplane. While the very idea of splitting the sail to let any portion of air pass through is radically opposed to accepted theories on the subject, Mr. Burnham, the author of the experiments, states that on certain points of sailing the slotted sail showed superior driving power to one of the standard type.

STATISTICAL DUPLICATION.

Statistician Powers, of the Census Bureau, is making special efforts to plan a successful campaign whereby full agricultural statistics shall be gleaned for the coming twelfth census. The law specifies only the crops of 1899 as those to be reported; but, as the census agents will not take the field till after June 1, 1900, and the bulk of the great crops of 1899, especially in the South, will be harvested and marketed long before that time, growers will be expected to furnish statistics to the enumerators, some of which will be quite a year old. It is desired by the Bureau that growers be prepared to do this, and to that effect it is using every channel to notify them of the necessity of being thoroughly posted as to what they grew and marketed, and the prices obtained therefor.

The strange part of all this is that our Department of Agriculture has a most efficient, long trained force for this very purpose; and not only their annual but their monthly statistics are the most complete of anything of the kind attempted in any country. Yet this working force will be entirely ignored, its records passed as of no avail, and exactly the same work and results as theirs will be attempted with comparatively raw, untrained recruits. That such statistics will differ from, and must be of considerably less scientific value than, those of the Department of Agriculture goes without the saying.

We call attention to this just at this time in the hope that it is not yet too late for the press of the country to take the matter up and induce a change of some magnitude to be made in the plans of the Census Bureau. General Merriam is sure to find the funds at his disposal far from what he will require for special features of great value to all students of commerce and political economy, if thousands of dollars are thus used to duplicate the work of the Department of Agriculture.

The same thing might also be well illustrated by reference to the duplications of work now being well done by the Treasury, Interior, Post Office and War Departments.

EXCHANGING FISH FRY WITH EUROPE.

Many tourists who will attend the Paris Exposition next summer need not be surprised if they find on the bills of fare of the leading European hotels such items as "American black bass," "American salmon," or "American muskalonge." It should not be hastily concluded that these items are put there for deceptive purposes, or that they refer to canned or dried American fish. They are in reality true statements of facts, and indicate the growth of our fishing interests under the wise and progressive supervision of the United States Fish Commission. During the past summer American fish, fresh from the water, appeared on the tables of European hotels devoted specially to catering to American tourists.

In order to appreciate the full meaning of this, it is necessary to glance at a feature of the work planned years ago by the Fish Commission. Almost thorough and painstaking effort was made then to collect all possible facts concerning our food fishes as a preliminary to adopting adequate methods for protecting and propagating young fry. This scientific study and experiment included an elaborate investigation of the food plants of fish in inland waters, the cause of famines and years of plenty, and the relative chances of certain varieties of fish in strange waters in reaching maturity.

In propagating the young fry for restocking the streams, bays, and rivers, experiments were made to see how well they thrived in waters far removed from their natural habitat. This experiment proved of great commercial value to the country. Inland waters that were almost destitute of fish are now teeming with millions of artificially propagated fry. In some of the new waters they have been transplanted to, the food fishes have been found to thrive better than in the streams where they were found. The extension of this work to foreign waters was anticipated by the Fish Commission years ago purely as a scientific test. Consequently when they received intimations from leading ichthyologists abroad that an exchange of native fry would be agreeable, preparations were immediately made to send our fish to European countries

The first experiment was made in Scotland with our landlocked salmon. The inland waters of Scotland presented conditions somewhat similar to those in which our salmon loved to disport, and besides there was a species of Scotch salmon native to the streams and lakes of that land. Young fry of our landlocked salmon were shipped to Scotland some ten years ago, and in that time they have multiplied rapidly, much to the detriment of the Scotch salmon. The American salmon proved larger and stronger than their native cousins, and the Scotch salmon is almost threatened with extinction by the growing rapacity and multiplication of the American landlocked salmon. On the whole, however, this is not to be regretted, for the American species furnish more and better food than the Scotch salmon.

A shipment of American black bass fry was made to France for stocking the rivers and streams, and, like the American salmon in Scotch waters, they have flourished so marvelously that to-day they are quite common articles of diet at the French hotels and restaurants. The French streams, since the introduction of the American bass, have doubled in their productive value, and there is every reason for the French anglers to be grateful to our American Fish Commission for stocking their waters with a new species of food fish. The French streams were practically deserted when the fry were introduced, and they had little difficulty in taking quick and complete possession of the waters.

Other varieties of fish have been shipped to France and other countries as scientific experiments. The American rock bass has been introduced in several English streams, and the American brook trout is today in flourishing condition in the clear, cold streams of Russia and other northern countries of Europe. The waters of Switzerland abound with many of our common river and brook fish, which make the angling there superior to anything in the past. It is even reported that the fine American muskalonge has found a satisfactory home in the Rhine and Danube Rivers.

In return for these American food fishes we have received few foreign fry that have proved of any particular value. The attempt has been made to introduce the best of the European fish in our waters, but as a rule American fish are superior to any that Europe can produce, and we have not been greatly benefited by the exchange. The Scotch salmon has been tried here, but holds out little promise of success in waters where the American salmon lives There is reason to believe that we will be more benefited in introducing the young fry of South American fish in our northern waters than any that can be brought from Europe. The condition of ichthyology in the countries south of us, however, is such that it is difficult to secure the fry without sending an expedition after them. At present it seems as if we had sufficient varieties of fine, toothsome fish in our waters to satisfy the most fastidious epicure; but it is possible that in its scientific investigations with the fish from all parts of the world, the commission may some day add to our fish diet some new species that will prove of enduring value. Meanwhile, the scientific search after facts concerning the food and habits of our American fish at home and abroad will enable the commission to handle the problem placed before them with more assurance of success. In the comparatively few years it has been laboring in the field it has accomplished results that are well known, and of value alike to the consumer and the sportsman or professional fisherman. There are few scientific studies and experiments that show practical results sooner than that of fish culture. G. E. W.

THE MINING INTERESTS OF AFRICA.

The mining interests of Africa, especially the wonderful gold and diamond fields, are particularly interesting at the present time owing to the unsettled conditions in the Transvaal. Much of the recent rapid development of Africa, especially in the southern part, is due to the discovery and development of extremely valuable mineral deposits, particularly of gold and diamonds, and incidentally it may be mentioned that the iron, coal, and other mineral deposits of South Africa give great promise when the wealth-seekers find time to turn their attention to industries which are less speculative.

The gold and diamond mines are wonderfully profitable. The Kimberley mines, which are located in British territory just outside the boundaries of the Orange Free State and about 600 miles from Cape Town, now supply about 98 per cent of the diamonds of commerce. The existence of these mines as unknown prior to 1867, and in the brief period since their discovery $350,000,000 worth of rough diamonds have been taken from the Kimberley mines, and the stones were easily worth double this sum after cutting. This enormous production would have been greatly increased but for the fact that the owners of the mines in the vicinity formed an agreement by which the annual output was so limited as to meet, but not materially exceed, the annual consumption of the world's diamond markets. The supply is so plentiful and so comparatively inexpensive is the work of diamond digging that the industry has almost ceased in other parts of the world since the South African mines entered the field.

Equally wonderful and promising are the great "Witwatersrand" gold fields of South Africa, located in the South African Republic, better known as the "Johannesburg mines." The strip of territory a few hundred miles long and a few miles in width to which this name is applied was, a few years ago, considered nearly worthless, useful only for the pasturage of cattle and sheep. According to our Treasury Bureau of Statistics, gold was discovered there in 1883, and in the next year the gold production was about $50,000. The output increased with startling rapidity. The amount of gold mined in 1888 was $5,000,000; in 1889, $10,000,000; in 1892, over $20,000,000; in 1895, over $40,000,000; and in 1897 and 1898, $55,000,000 each year. This wonderful development naturally attracted great attention to South Africa and drew thither thousands of people in the hope of making fortunes rapidly. The mines, however, cannot be successfully worked except by the use of costly machinery, and while they have been extremely productive where machinery has been used, they were not of such a character as to make hand or placer mining profitable, as was the case in California and Australia and other places. The gold production of the "Rand," since 1884, has been over $300,000,000, and careful surveys of the field show beyond question that $3,500,000,000 in gold can probably be extracted, while the large number of mines which have been located in adjacent territory, particularly in parts of Rhodesia, give promise of additional supplies, so that it seems probable that South Africa will for many years continue to be as it now is, the largest gold producing section of the world. Recent discoveries tend to the belief that these wonderfully rich mines are the long lost "Gold of Ophir" mines from which Solomon obtained his vast supplies.

RAILROADS IN 1898.

A welcome visitor to the editor's table is "Poor's Manual of Railroads for 1899." The general statistics regarding the roads for the year are most important and authoritative. The general exhibit for the fiscal year shows that the length of our railroads on December 31, 1898, was 186,809 miles, showing an increase of 1,915 miles in the year. There is in addition to the mileage already given 60,344 miles of second tracks, sidings, etc., making a grand total of 245,238 miles of track. Of this mileage, 220,803 miles of track are equipped with steel rails and only 24,435 miles have iron rails. There are 36,746 engines, 25,844 passenger cars, and 1,284,807 freight cars. The total liabilities of the companies are $11,968,751,204; the excess of assets over liabilities is $316,616,498. The total assets are $12,285,367,702. The actual number of miles of railroad operated was 184,532. The total train mileage was 905,010,232. In 1898, 514,982,288 passengers were carried and the passenger mileage was 13,672,497,664 miles; 912,973,853 tons of freight were moved. The passenger traffic earnings amounted to $272,589,591. The earnings from freight were $868,924,526. The total earnings from all sources were $1,249,558,724. The net earnings amounted to $389,666,474. The total available revenue was $494,203,378.

These figures show what an enormous business our railroads are doing, and our progress is all the more remarkable when we remember that it was not until 1842 that the railroad was opened from Boston to the Hudson, and from the Hudson at Albany to Lake Erie at Buffalo. In 1848 the progress made in railroad construction was so slow and unpromising that the total mileage of lines completed at the end of that year was only 5,996. In 1848, immediately after the annexation to the United States of California, the deposits of gold of marvelous richness caused great excitement, and the first movement in the construction of railways dates from the discovery of gold in California. From 1849 to 1857, 17,138 miles of railway were constructed. Then came a great commercial revulsion, which commencing in the United States swept around the world. But the nation had grown too strong, however, to suffer anything more than a temporary check. The lines of railroad which had been constructed penetrated every important portion of the country and gave high commercial value to its products. Labor everywhere was then enabled to reap, even in the midst of the great depression that prevailed, a remunerative return.

SODA WATER TO RELIEVE HUNGER.

Water charged with carbonic acid gas—in other words, soda water—is now prescribed as a palliative for hunger, especially for an abnormal sense of hunger due to disease. Says Modern Medicine, which gives us this information: "Carbonic acid gas has the singular property of lessening the sense of hunger, and may profitably be remembered in dealing with cases of diabetes in which bulimia (abnormal hunger) is a prominent symptom. The seat of hunger is found in the solar plexus. By the use of water charged with carbonic acid gas, the branches of the solar plexus distributed through the mucous membrane of the stomach are influenced in such a way that the abnormal irritation of the plexus, which is the foundation for the ravenous hunger often present in diabetes and certain forms of indigestion, may be greatly mitigated, if not wholly appeased. Water charged with carbonic acid gas may likewise be employed with advantage in many cases of hyperpepsia in which there is a sensation present in the stomach described by the patient as a gnawing sensation, 'goneness,' emptiness, etc."

Bacteria as Destroyers of Masonry.

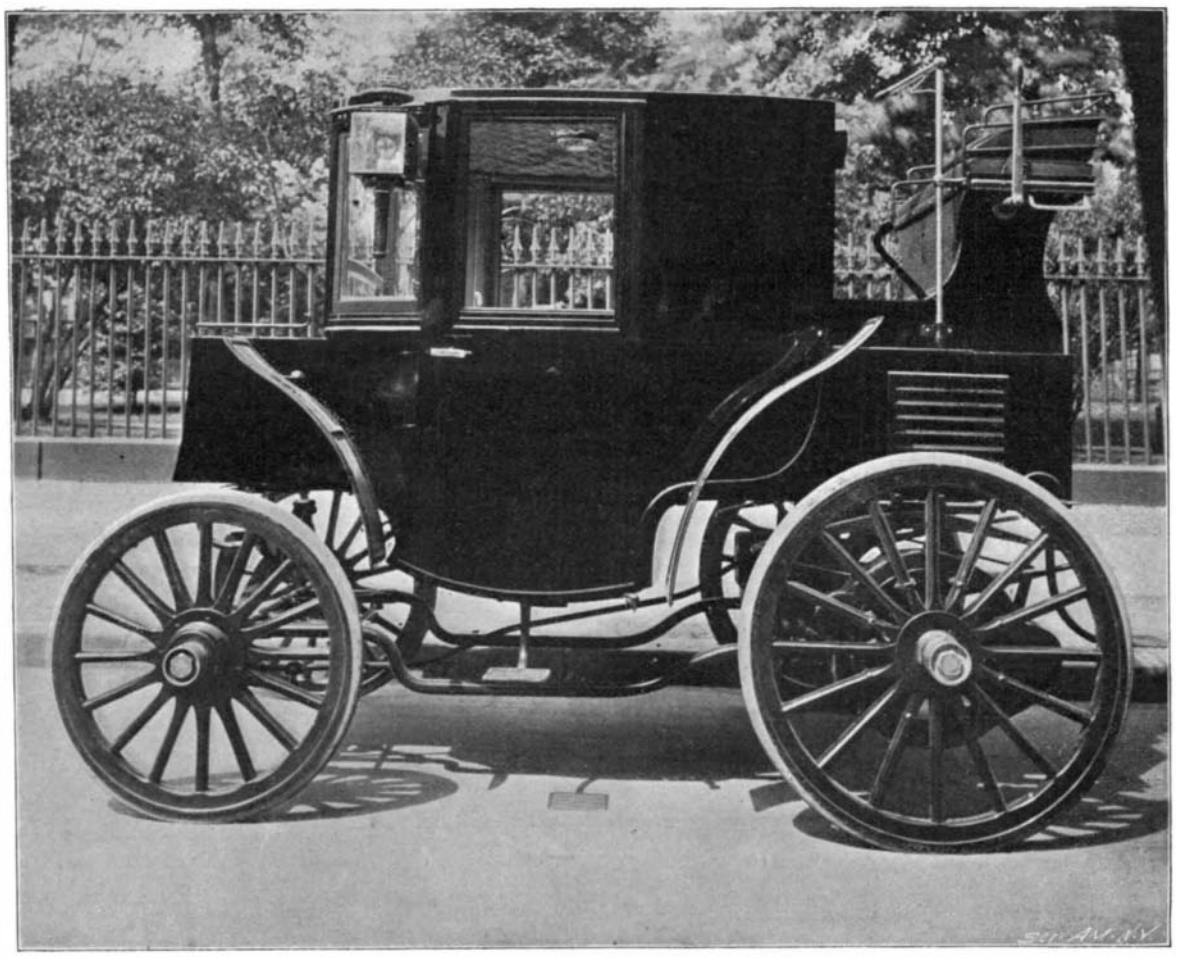
Bacteriology has shown how we may count alike upon friends and foes among the myriads of bacteria known to us, says The Lancet. The friendly species, however, are decidedly in the ascendancy, but comparatively few pathogenic organisms having been isolated and recognized. Recent researches have shown how important is the role of the bacterium in many industrial processes, especially where the production of articles of food is concerned. Ascertained facts would seem to teach that bacteria after all may serve us as tiny engineers who can perform stupendous work when associated in myriads, so long as they are placed under a favorable environment. The disposal of sewage by purely bacterial agencies, which under suitable conditions convert an offensive material into simpler and innocuous materials, is perhaps the best case in point. But the disintegrating action of bacteria, though perhaps an indirect one, must, according to recent observations, be reckoned with as a source of mischief. At first sight it would seem hardly possible for bacteria to be concerned in the breaking down of a stone wall, yet such would appear to be the case, according to some ingenious observations directed to the nature of the decay of cement. The gradual disintegration of the cement mortar used in water supply reservoirs is one of the serious troubles met with by water engineers, and a trouble which so far they have not been able to avoid with any measure of practical success. Hitherto this action was supposed to be the result of the solvent property of carbonic acid and other mineral substances commonly present in a water supply. The cement gradually disintegrates and becomes a kind of mud which slowly detaches itself. This strange process is due to the action of none other than that bacterium known as the nitrifying organism. An examination of the mud shows it to be teeming with these organisms. The organism, however, cannot flourish in the absence of nitrifiable pabulum. In its presence, however, nitrous acid is produced, which leads most probably to the disintegration of the cement lining of the water reservoir. The nitrifying organism is the one upon which so much depends in the purification of sewage and effete matters. On this account its growth should be encouraged, and it is curious, therefore, to find that the organism appears as an objectionable factor in the attempt to supply and store an abundance of pure water for drinking purposes.

A NEW RIKER ELECTRIC VEHICLE.

A few months ago we illustrated an electric two-seated open surrey built on the Riker system. Since then an improved form of an electric demi-coach has been constructed, illustrated in the accompanying engraving.

In designing this vehicle Mr. Riker had in mind the needless present custom of locating the driver in front of the vehicle. His idea is to give the occupants a free unobstructed view of the road at the same time protect them, in case of accidental collision, by locating half of the storage battery in the front box-like compartment and the other half in the rear under the driver's seat. This design gives the carriage a symmetrical and well-balanced appearance. The controller lever, steering lever and foot brake are clearly shown attached to the driver's seat. This is wide enough to hold two persons, one for an attendant to open the carriage doors and the other the operator. The vehicle is steered by the movement of the front wheels, connected by a rod to the rear steering lever.

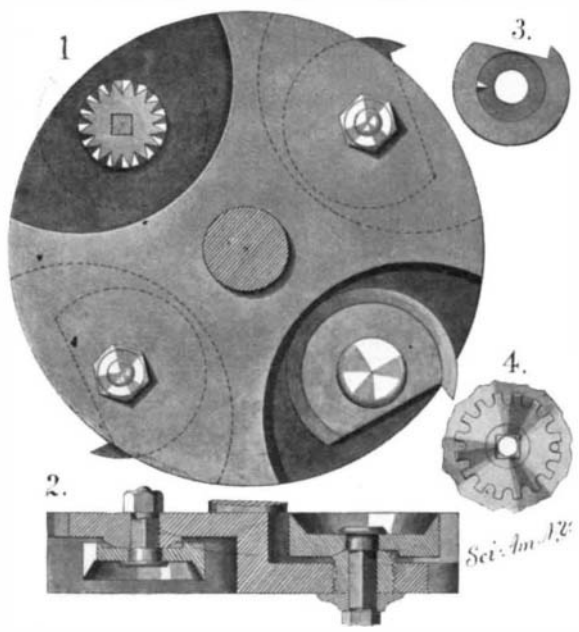
The coach will carry four persons inside, has a full glass front, an electric light in the roof and exterior lamps. It is also elegantly upholstered. The wheels are fitted with solid rubber tires and the rear ones are 42 inches in diameter, and are propelled by 2-kilowatt electric motors, one for each wheel. The total weight of the vehicle is about 4,200 pounds. Attached to the back in front of the operator is the usual combined voltmeter and ammeter. It is intended to travel at a speed of ten miles an hour, and one charge of the battery will carry it 25 miles on a level macadam road. The Riker Electric Vehicle Company, recently organized for the further development of this and other styles of motor vehicles, has installed a new and extensive plant at Elizabethport, New Jersey, equipped to make every part of a vehicle.



AN ELECTRIC DEMI-COACH.

A NOVEL MATCHER-HEAD FOR PLANING MILLS.

A patent has been granted to Charles R. Harvin, of Parksville, S. C., for a matcher-head, by means of which the cutters or bits can be vertically adjusted to adapt the device to different widths of tongues or grooves. Fig. 1 is a top view of the head with one of the cutters or bits removed. Fig. 2 is a section taken through two adjacent cutters. Fig. 3 is an inner face view of one of the cutters or bits. Fig. 4 is a bottom plan view showing an adjusting mechanism employed.



A MATCHER-HEAD ROTATIVELY AND VERTICALLY ADJUSTABLE.

It is not customary to adjust the bottom cutters or bits vertically; but the upper cutters are, however, thus adjusted to adapt the matcher-head to different thicknesses of floor-boarding or to different widths of tongues or grooves. The means for adjusting the upper cutters or bits will, therefore, be first described.

Each upper cutter or bit has a depression in its inner face, at one side of which depression is a tooth adapted to engage one of a series of notches in the upper end of an exteriorly-threaded sleeve. A bolt passes through the cutter or bit and has a portion angular in cross-section passing through a correspondingly-shaped opening in the sleeve. A washer engages the outer end of the angular portion of the bolt and is provided with notches in its periphery to receive a lug on the under side of the cutter-head. A clamping-nut on the bolt holds the parts in place. In adjusting one of these upper cutters, the clamping-nut is loosened sufficiently to allow the washer to drop clear of the log. The washer can then be turned by a suitable tool, its movement being communicated to the bolt, to raise or lower the threaded sleeve. After being vertically adjusted, the cutter is raised to disengage its tooth from the notches in the upper end of the sleeve. The cutter-head may then be rotated to bring its cutter portion outside of the cutter-head, as shown in Fig. 1. When in this position the cutter is lowered to engage its tooth in a notch; the washer is moved to engage the lug, before mentioned, in one of its notches; and the device is tightened by screwing up the clamping-nut.

The bottom cutters or bits also have each a tooth on their inner faces, which is adapted to engage one of a series of notches in a boss on the under side of the cutter-head, so as to hold the head as rotatively adjusted. The bottom bit is clamped by a bolt and nut.

The Comparative Dietetic Value of White and Wholemeal Bread.

It is commonly supposed that wholemeal bread is more nourishing than ordinary white bread because it contains a higher proportion of nitrogenous and mineral substances. But as we have frequently pointed out, says The Lancet, the nitrogenous value of a given food is not necessarily indicated by an empirical chemical analysis. Not all nitrogenous substances are feeding stuffs, and further, it does not follow that the quantity of food partaken of is the quantity of food assimilated. In other words, eating is not necessarily feeding. There are many substances containing a very high proportion of nitrogen which are valueless as food stuffs, and on the contrary there are many edible materials which contain a comparatively small proportion of nitrogenous substances which, however, are completely available for nourishing the organism. We now know that it is not enough for chemical analysis to record merely the proportion of nitrogenous substances; the nature of these substances must be declared, without which the food value of a given substance cannot be estimated. It was formerly assumed that wholemeal bread contained more nitrogen than white bread, but in the light of recent analyses this is not true. Whether or not, however, wholemeal bread is superior as regards its nitrogenous contents, it is certainly inferior as regards its digestibility. This may be attributed in a large measure to the fact that wholemeal bread contains comparatively large, indigestible, and irritating particles of husk. There seems, however, no reason for doubting that wholemeal bread would be much more digestible if the branny particles were finely comminuted. In several patent breads the germ of the wheat is retained, which adds considerably to the nitrogenous value of the bread. But the germ of wheat tends to excite fermentative changes in the "sponge" and produce an unpalatable loaf. Several processes, however, have been devised which avert the possibility of this undesirable effect. We do not believe that with the improvements in machinery generally the dietetic value of bread has pari passu increased. We still hold that a more nourishing article, as it is certainly more palatable, is the old-fashioned farmhouse loaf, which presents a gold wheaten color rather than the blanched appearance which seems to be looked upon as a guarantee of quality in the modern white loaf. Our own laboratory experience, at any rate, shows that probably on account of the increased employment of roller milling processes the important mineral constituents of white bread have very materially diminished. When it is considered that these constituents play a not unimportant part in supplying the bone-forming factors of the organism, this fact assumes a serious importance and may even throw light upon the prevalence of dental decay. On the other hand, wholemeal bread and germ bread contain an enhanced proportion of mineral salts, such as the phosphates of lime and potash, which are necessary in the building up of the entire human frame.

THREE thousand five hundred and three vessels of all kinds passed through the Suez Canal last year, and of this number 2,295 carried the British flag. The receipts for 1898 were larger than in any previous year since the opening of the canal.