

**A NEW DYNAMO-ELECTRIC MACHINE.**

We give an engraving of a new continuous-current dynamo-electric machine, recently perfected by Mr. Clinton M. Ball, of Troy, N. Y. This inventor has been engaged during some years past in building machines similar in type to the alternating current machine of Hefner-Alteneck (recently described in the SCIENTIFIC AMERICAN SUPPLEMENT), especially in respect to the absence therein of solid metal parts in the armature, the latter being constituted in the form of a disk composed of a series of coils without iron cores, arranged and adapted to be moved in a magnetic field consisting of a series

of poles of alternately opposite polarity on the same side of the disk, and facing opposite sides of the disk. Mr. Ball has perfected several forms of continuous-current machines of this general type, and from among them we have selected two forms, which we illustrate. These machines have been operated with entire success at Troy; and samples of the machine are either already installed at the Paris Exhibition of Electricity, or are on their way to that destination, forming a part of the joint exhibit made by the "White House Mills" and Mr. Ball.

The bipolar machine, Fig. 1, reproduces the effects of the well-known Gramme machine, over which it possesses important advantages. Its special peculiarities and advantages may be briefly summed up as follows: The armature is composed of coils, six in number, each of which occupies a sector of the disk of 60°. These coils are made self-supporting in the disk, without iron cores or metallic parts other than the wire of which they are composed, and are connected in a continuous circuit. The commutator plates are six in number and constitute the terminals of offshoots from the junctions between two contiguous coils. These commutator plates are usually disposed spirally about the axis of the arbor of the machine so as to show at opposite ends an angular displacement from axial parallelism of 30°. From this it results that during rotation a pair of diametrically opposite coils in the armature are by-circuited during one twelfth of a revolution at the neutral point of the machine, and this effect recurs successively through the entire series of coils. It will be understood that an important advantage is gained by this arrangement, inasmuch as the resistance of the inactive coils of the armature is thereby eliminated from the internal circuit of the machine. This machine, used as a generator, presents striking and powerful effects with small expenditure of power. It may be used as a very perfect form of an electro-magnet motor. It runs without serious sparking at the commutator, and is simple and compact in construction. A further noticeable feature, which exists furthermore in all machines of this type, is the absence of any noticeable external magnetic field when running.

The other machine, Fig. 2, is a compound multipolar continuous-current machine, embodying characteristics of fundamental arrangement which distinguish it from all others; while, as before stated, in some of its theoretical aspects it resembles the machine of Hefner-Alteneck described in the article in the SUPPLEMENT.

The machine represented in the engraving, it will be noticed, has only six opposite pairs of poles in the field system. The continuous current armature system of the machine has eight elements, and the commutator twenty-four plates. The armature is otherwise composed in two sections or layers, the major section of which is utilized through a commutator or contact rings of ordinary construction for doing work upon the external circuit, while the continuous-current section maintains the magnetism of the field.

In this machine, developed and constructed long before the publication of any descriptions of Hefner-Alteneck's machine, the currents are commutated continuously, somewhat as in his machine, the commutator connections being so made that while the contact brushes remain in a fixed position, the currents are brought to them from the consequent electrical poles of the armature—the consequent points, during rotation, assuming successively different positions in relation to the field, and completing the cycle of changes during

half of a revolution of the armature. During this time, furthermore, the line bisecting the armature and marking the consequent electrical points, has twice traveled over the complete circuit of the field in advance of rotation. In the case of a machine having more poles in the field than armature elements, the movement of this line would be retrograde; however, if the multiple of half the number of field poles into the number of armature elements remained the same, the number of changes would be the same in either case.

It will be seen that this machine differs from that of

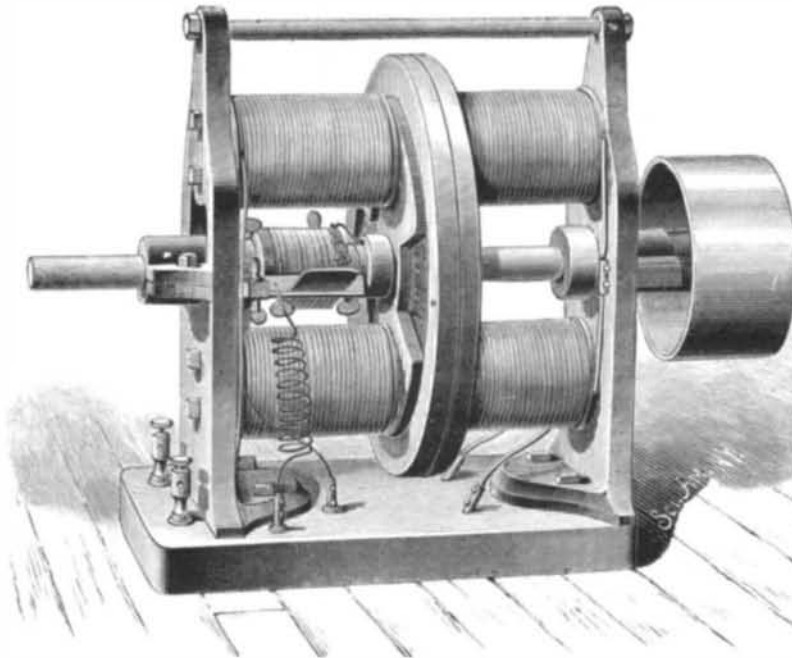


Fig. 1.—BIPOLAR DYNAMO-ELECTRIC MACHINE.

Hefner-Alteneck in respect to the proportion of armature elements to the number of poles of the magnetic field—the Ball machine, having a larger number of armature elements than of field poles, while his has a less number. The arrangement selected by Mr. Ball is more favorable to a simplification of details of construction without detriment to the efficiency of the machine.

At a speed of rotation of 950 to 1,000 per minute, and with an expenditure of 5½ to 6 horse power, this machine has proved capable of maintaining a series of ten to

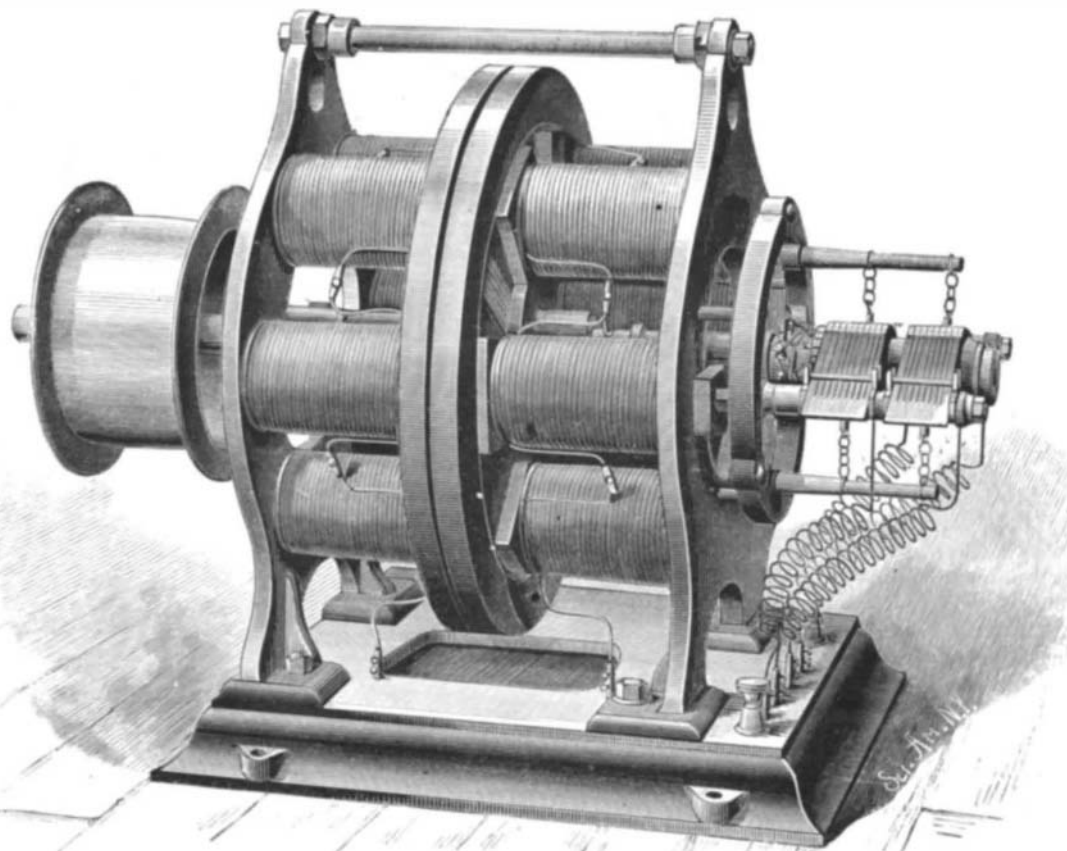


Fig. 2.—COMPOUND MULTIPOLAR CONTINUOUS-CURRENT MACHINE.

twelve arc lights of good power. The machine weighs only 850 lb.

**RECENT INVENTIONS.**

Mr. Samuel B. Jenks, of Grand Rapids, Mich., has patented an improved electric belt for medical or therapeutic purposes. The invention consists in an electrode for an electric belt, having a sponge fastened in a cup-shaped button on the belt.

An improved adjustable notching cutter has been patented by Mr. Philander H. Elwell, of Cincinnati, O. This invention relates to an improvement on the die or cutter usually employed to form the re-entrant angles or corners in enve-

lope blanks, and is applicable to every description of envelope, each bit being for this purpose composed of an angular piece of steel, one of whose leaves or limbs is perforated to receive a screw bolt having at its mid-length an eye that engages over another bolt, which is made square in the middle to receive a wrench.

Mr. Frank H. Carr, of Bancroft, Mich., has patented an improved device for coupling cars automatically and releasing or detaching them safely and conveniently.

An improved incubator has been patented by Mr. Joseph Colson, of Brentwood, N. Y. The object of this invention is to utilize to the best advantage the heat developed by the flame of the lamp by which the incubator is warmed.

An improved electric gas-lighting device has been patented by Mr. George J. Murdock, of Binghamton, N. Y. It consists in a sliding valve or cut-off controlling the supply of gas to the burner, which valve is attached to the armature of an induction coil contained in a casing and supported on the end of a hollow arm, through which the gas passes before reaching the burner. Wires lead from the poles of the coil to the opposite sides of the slot of the burner, and when the circuit is closed the gas valve or cut-off is opened, permitting the gas to pass to the burner, when it is ignited by the spark caused by the interruption of the circuit.

Mr. Ivan Carlier, of Hot Springs, Ark., has patented improvements in absorption ammonia ice machines for the purpose of preventing steam or vapor from being mixed with the ammonia gas which is produced in this machine, and for avoiding an undue pressure in the ammonia boiler. The invention consists in combining a smaller boiler with the main liquor ammonia boiler, these two boilers being connected by top and bottom tubes.

Mr. Fredrick E. McKinley, of Wellington, Kan., has patented an improved school desk and seat. The invention consists in combining an ink stand socket with a desk having apertures and a stationary bar that supports as well as pivots it.

An improved harness saddle has been patented by Mr. James H. Carrick, of Traer, Iowa. The yoke is widened at the lower part, and provided with flanged side edges, forming chambers for receiving side straps, in combination with the skirts, terret, screws, and nut plates, and carrying loops.

An improved folding basket has been patented by Mr. James H. Dennis, of Newark, N. J. The object of this invention is to construct baskets in such a manner that they can be folded into small space for convenience in transportation.

Messrs John Kienzy and Charles F. Davis, of Bridgeport, Conn., have patented an improved faucet which consists in a tube bent downward at the outer end, and provided at its inner end with a valve seat, on which a valve fits, attached to a screw spindle contained in a cylindrical inclined arm of the main tube.

An improvement in the treatment of furnace slag has been patented by Mr. Alexander D. Elbers, of Hoboken, N. J. This invention has for its object the rapid and cheap conversion of fluid slag and its solidification into such shapes as to materially increase its utilization. The inventor allows the fluid slag to spread swiftly in the revolving gutter, which, by preference, is made in adjustable sections and of iron or steel plates, into which it flows by a spout which is made movable so as to direct the course

of the flow. The apparatus, to which the gutter is fastened, is best constructed in the form of a so-called "carousel," which can be quickly turned, and the size of the apparatus will depend on the quantity of slag which is to be run into the gutter. After the apparatus is set in motion, the first layer of the slag, as it flows from the trough into the revolving gutter, will almost instantly become chilled by contact cooling with the bottom and sides of the gutter, while the subsequent layers have to be mainly solidified by the rapid air circulation on their surface. As the liquid slag unites or welds readily with the underlying already solidified but still very hot slag, a weld of all the layers as they accrue during rotation is to be expected.

A glove buttoner, by which a glove may be buttoned without stretching or tearing the button hole or twisting off the button, has been patented by Mr. Nathaniel Pyles, of Westport, Mo. This glove buttoner is provided with a broad slotted hook having its inner portion grooved out to fit the periphery of a button, whereby the button may be rigidly held in a horizontal position while the button hole is being passed over the end of the buttoner.

An improved sound transmitter has been patented by Mr. Henry B. Porter of Chicago, Ill. This invention relates to that class of telephone transmitters in which the undulations of the electric current in the wire are controlled by the varying pressure of a conducting surface on a piece of carbon, which variations of pressure are controlled by the vibrations of a diaphragm, and which current is made through the contact faces.

#### THE EIDER DUCKS.

The eider duck (*Somateria mollissima*) is widely celebrated on account of the exquisitely soft and bright down which the parent plucks from its breast and lays over the eggs during the process of incubation. Taking these nests is a regular business on the northern coasts of Norway and Scotland, but is not devoid of risk on account of the precipitous localities in which the eider duck often breeds. The nest is

covery belongs to Dr. Zenker, of Dresden, Germany. The disease was discovered in a servant girl, admitted as a typhus patient to the City Hospital in Dresden. She died, and her flesh was found to be completely infested with trichinæ. Leuckart's and other experiments have shown that a temperature of 140 degrees Fahrenheit is necessary to securely render trichinæ inert. Direct heat applied to the slides holding specimens of trichinous pork, by means of the Schultz heating table, has demonstrated under the microscope that a temperature of 50 degrees centigrade (122 degrees Fahrenheit) is necessary to the certain death of the trichinæ. Leisner's experiments with trichinous pork, made up into sausage meat and cooked twenty minutes, gave positive results when fed to one rabbit and negative by another. He sums up his experiment as follows:

1. Trichinæ are killed by long continued salting of intected meat, and also by subjecting the same for twenty-four hours to the action of smoke in a heated chamber.

2. They are not killed by means of cold smoking for a period of three days, and it also appears that twenty minutes cooking freshly prepared sausage meat is sufficient to kill them in all cases.

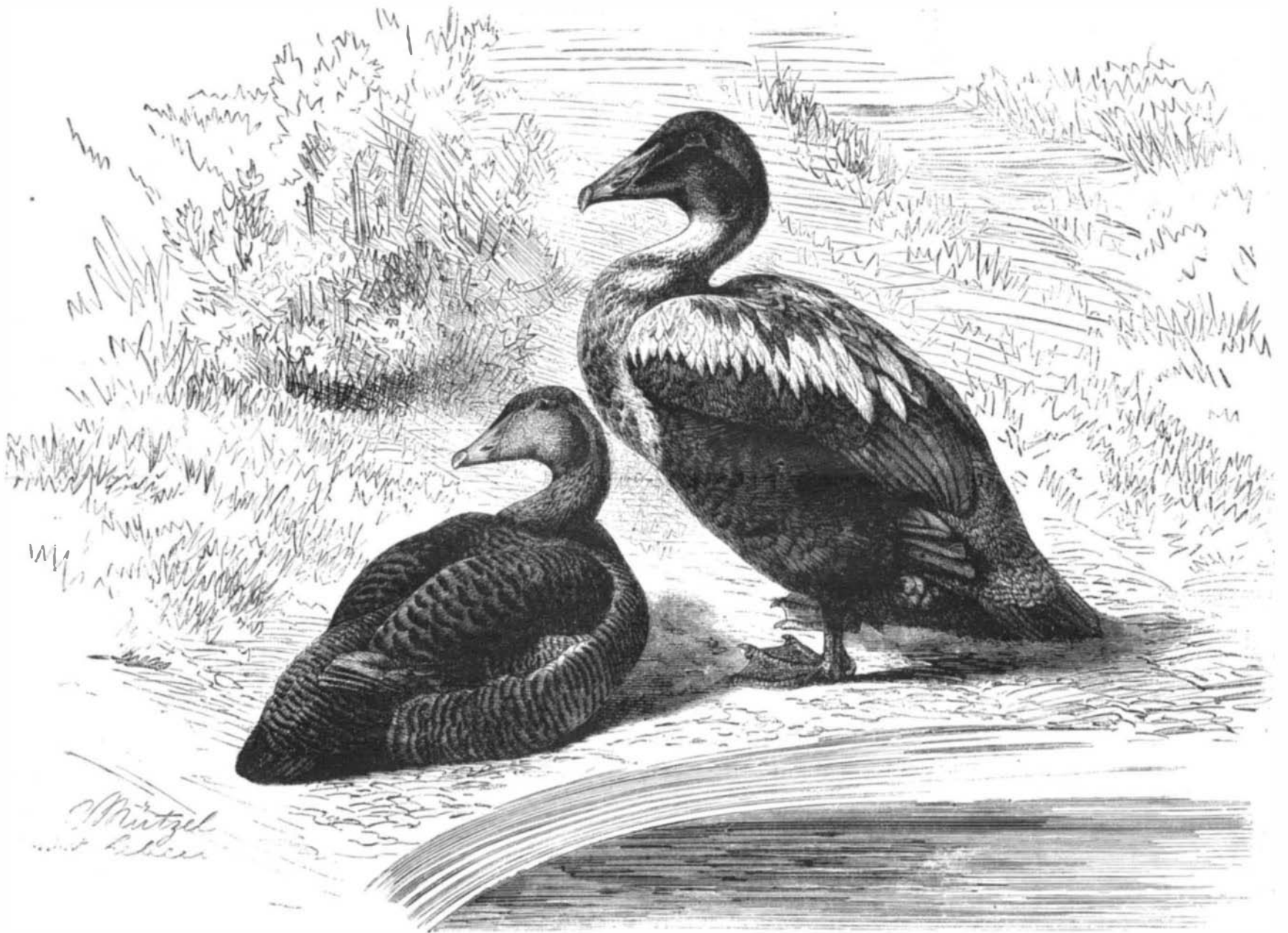
The various kinds of cooking, however, are quite different in their effects on trichinous pork. Frying and broiling are most efficient, roasting coming next. Boiling coagulates

#### Worms in Fishes.

Several communications have been received lately asking whether the small white worms infesting black bass are injurious to those who may eat the fish.

Such parasites are very common in fish, and the best authorities say that they are harmless to man; indeed Italian epicures regard certain species occurring in sea fish as a great delicacy. Of this class apparently are the white or transparent round worms which our correspondents find in the bass of the Susquehanna. They are known as *Hematomodes*. Another group of fish parasites, *Cestodes*, resemble ordinary tape worms, but do not flourish in the human organism. The *Trematodes*, or flukes, and *Acanthocephalis*, two other groups of fish parasites, are too small to attract the attention of any but microscopists.

In an article on this subject in *Forest and Stream*, some months since, Mr. Frederic W. True, of the Smithsonian Institution, said that the salmon harbors at various times no less than sixteen different kinds of parasitic worms, or at least so many sorts have been discovered, and undoubtedly many others remain unknown. Four species are tape worms, and four round worms; the rest belong to the other groups above mentioned. The yellow perch has been a favorite hunting ground for the helminthologist, and he has already brought to light twenty-three species. The pike



#### EIDER DUCKS.

made of fine seaweeds, and, after the mother bird has laid her complement of eggs, she covers them with the soft down, adding to the heap daily until she completely hides the eggs from view. The plan usually adopted is to remove both eggs and down, when the female lays another set of eggs and covers them with fresh down. These are again taken, and then the male is obliged to give his help by taking down from his own breast and supplying the place of that which was stolen. The down of the male bird is pale colored, and as soon as it is seen in the nests the eggs and down are left untouched in order to keep up the breed. The eider is a shy, retiring bird, placing its nest on islands and rocks projecting well into the sea. It is an admirable diver, its legs being set very far back, and obtains much of its food by gathering it under water. The bird lays from five to six eggs, of a pale green color. There are generally two broods in the year.

#### Trichinæ in Man.

For some thirty years subsequent to the first description of the capsule by Hilton, and some twenty-five years after the identification of the parasite itself in man, the same were looked upon as mere harmless curiosities, and that, although Leidy discovered the parasite in the flesh of swine in 1847, still it was not until 1860 that the connection was established between them, appearing, as they had, in two totally different species (men and swine). The honor of this important dis-

the albumen on the outer surface, and allows the heat to penetrate less readily; it should be kept up, therefore, for at least two hours for large pieces of meat. Whether boiled, broiled, or fried, pork should always be thoroughly cooked. Practically speaking, the cooking, salting, and hot smoking which pork in its various forms receives in the United States must be, in the vast majority of cases, sufficient to kill the trichinæ and prevent infection of the person consuming the meat. Everything like those reported in Germany are unknown here, and trichiniasis in a fatal form is undoubtedly a rare disease. In the vicinity of the great pork packing establishments near Boston the "spare-ribs," containing the intercostal muscles, are very largely bought and eaten by the people near by, and trichiniasis among them has not in a single case been reported, so far as I have been able to learn. The cuts being thin and well cooked any trichinæ in them are quite certain to be killed. Even when trichinæ are introduced into the intestinal canals, too they are sometimes expelled by diarrhea, and the invasion of the system by a small number does no harm.—*American Microscopical Journal*.

M. H. TOUSSAINT (*Comptes Rendus*) finds that no contagious malady possesses a greater virulence than tuberculosis, the virus resisting and preserving its efficacy at temperatures which destroy the bacteria of splenic fever. The infection takes place as easily by ingestion as by inoculation.

(*Esox lucius*) carries about with him at least twenty kinds. The parasites of our trout have escaped attention to a great degree, and it is credited with only one kind, but the European saibling plays host for five tape worms and three or four other worms. But one species is known to infest our shad, namely, the round worm, *Agamonema capsularia*, Diesing, although the German maifish (*Alosa vulgaris*), a close relative, carries at least seven. It must not be gathered from these facts that our fishes are more favored than those of other parts of the globe, but only that the parasites have been less carefully studied.

It was the shad worm (*Agamonema capsularia*) which caused some excitement among the fishermen in a certain part of New Jersey a few years ago, where it was found in great numbers. All anxiety was removed, however, by Dr. Leidy, of Philadelphia, the only American helminthologist whose observations have been at all extensive, who pointed out the harmless character of the animal.

The carp, lately introduced from Germany by Prof. Baird, undoubtedly brings with it some of the twelve parasitic worms which make its life unhappy in its native waters. Every new animal thus introduced in this way adds more than one name to the faunal list.

Mr. True has in his possession an undescribed tape-worm which infests the herring of the great lakes. It is not content to live in the intestines of the fish, but at a certain season in its development must needs bore into the flesh, pro-