THE TURBOT, GOLDBUTT, AND SOLE.

The scientific name of the flat fishes, as they are popularly called, is *Pleuronectidæ*, signifying "side swimmers." The upper side of these fishes is always dark, and the under side white; this guards them against the attacks of their enemies, the dark flat surface looking like the sand on which they love to creep. When swimming, they undulate through the water in a very graceful manner. "If the eyes were placed as is customary in fishes, one of them would be useless as long as the fish was lying on its side. By a modification of the bones of the head both of the eyes are brought to that side which remains uppermost, and they are thereby enabled to command a wide view around."

The turbot (*Pleuronectes maximus*) is the most highly valued of the flat fishes for the delicacy of its flesh. Its color on the left side is brown of various shades, lighter on the fins, and the whole of this side is spotted with round bony tubercles; the other side is white. The length of this fish is more than a meter; the weight, about thirty-five kilogrammes. Rondelet asserts that he has seen a turbot three meters long, two broad, and almost a meter thick. It is found in the German Ocean and the Baltic Sea, also in the Mediterranean. It is caught in the greatest abundance in the German Ocean.

Under the name *Platessa* may be found the species of fish with four cornered or egg-shaped bodies. The eyes and the color, as a rule, are upon the right side, but reversed specimens are quite common.

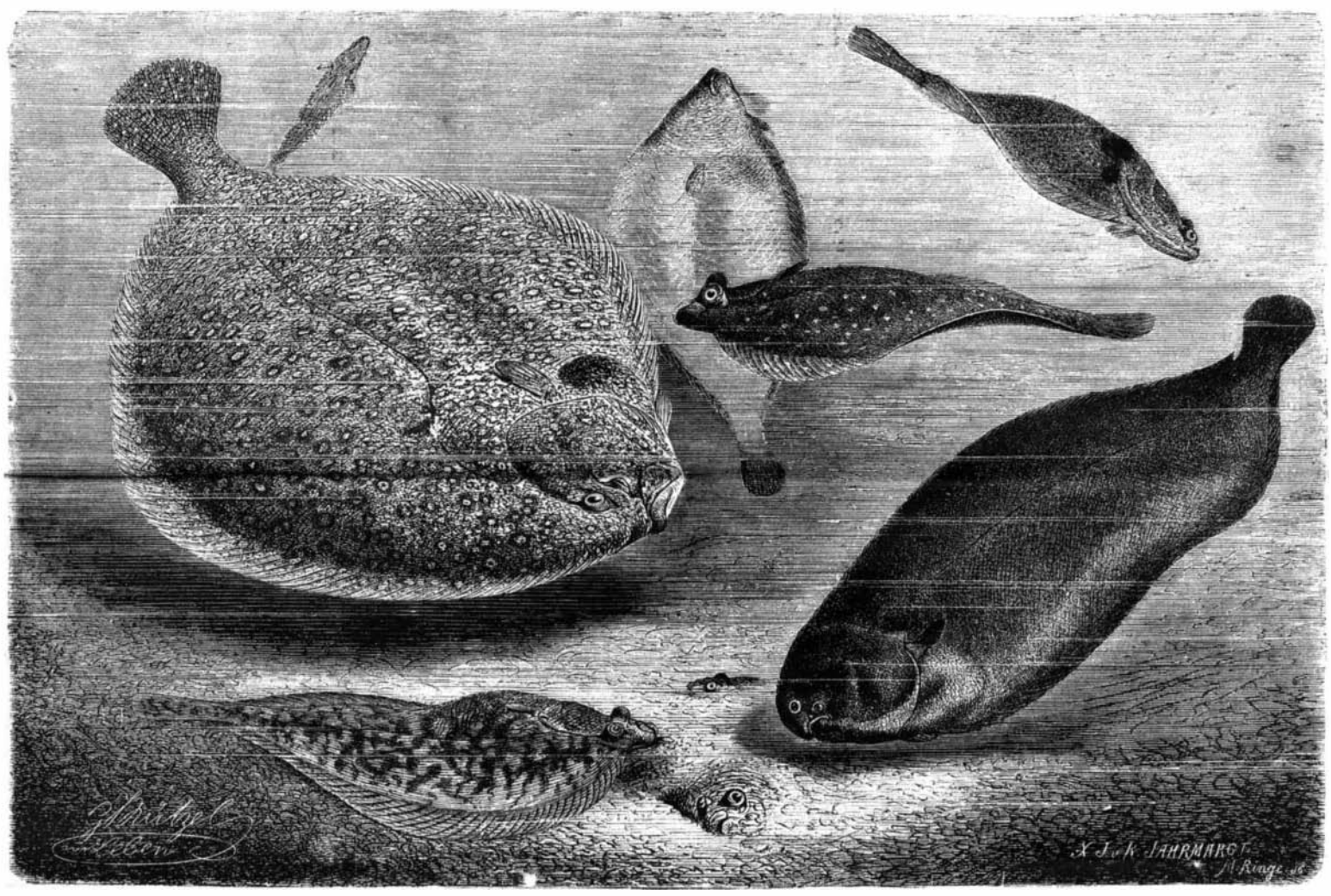
The goldbutt belongs to this family. Its length seldom exceeds sixty centimeters, its weight only exceptionally seven kilogrammes. It is variously colored, but generally the upper side is brown marbled with gray and marked with round yellow spots. The other side is yellowish-white. It is found almost everywhere in the Atlantic Ocean, the Mediterranean and Baltic Seas, and in great numbers in the German Ocean.

The sole (*Solea vulgaris*) is about sixty centimeters long, and weighs about four kilogrammes. Upon the upper side and upon the pectoral fins it is black, and on the other side brownish. It is found all along the coast of Western Europe, and is also abundant in the German Ocean.

Nearly all of the flat fishes are found in shallow, sandy places near the coast; but they sometimes retire into the deep water. The flesh of all the flat fishes is palatable, and that of many of them is of superior excellence. They form a very important article of food. On most of the sea coast they are only eaten when freshly caught, but in the North they are cut in strips and salted and dried in the air, as the codfish, or smoked. The goldbutt and turbot are specially valued. Great numbers of these fish are sent to the London market by the people of Holland.

The capture of the flat fish is carried on in various ways, according to the locality and their abundance. Sometimes the fishermen at the ebb of the tide wade into the muddy sand, hold the fish down with their feet, and then pick them up. In some places on the coast a great many may be caught in this way, but they are taken chiefly with a drag-net.

Many of the flat fish may be acclimated to live in fresh water. They may be kept in narrow quarters, and soon become accustomed to the vessels in which they are kept, learn to know those who care for them and their feeding time, and will often take their food from the hand. The turbot feeds upon mollusks and crustaceans, besides fish. — *From Brehm's Animal Life*



THE TURBOT, GOLDBUTT, AND SOLE.

NATURAL HISTORY NOTES.

The Flowering Plants of the World.—"The Genera Plantarum" of Bentham and Hooker, just completed, gives a rough approximation of the number of plants that compose the present phanerogamic flora of the world, according to the authors' own ideas, and according to the ideas of the writers. From this it appears that the polypetalæ comprise 30,966 species; the gamopetalæ, 34,567; the monochlamydeæ, 11,778; the gymnospermeæ, 415; and the monocotyledones, 17,894. Total number of flowering plants, 95,620 species.

This "number is, of course, but a very rough estimate," says the *Gardeners' Chronicle*, "but the above is the number computed by taking the lowest number given under each order by the authors as being what they consider the probable number of species contained in it according to their view, though probably this number is not always intended as an accurate census even of their own views; and, if the estimate of other authors were taken into the count, the total number would be considerably augmented." Some of the largest orders are: compositæ, with 9,820 species; leguminosæ, with 6,504 species; orchideæ, with from 4,500 to 5,000; rubiaceæ, with 4,104; gramineæ, with 3,200; euphorbiaceæ, with 3,000; labiateæ, with 2,600; and liliaceæ, with 2,100. Then, in point of number of species, come sixteen other orders containing from 1,000 to 1,902. There are ten orders that contain less than five species, and one of these, batideæ, contains but a single genus represented by a single species. It seems that, of the flowering plants of the world, about one out of every ten species known belongs to the order compositæ. To this latter belongs the largest genus, that of *Senecio*, with 900 species.

"Among the curiosities in geographical distribution it is interesting to note the number of genera (about forty) that are common to tropical America and tropical Africa, and are found nowhere else, some of them genera of several species, in which case the bulk of them is confined to America, and only one or two occur in Africa, sometimes as distinct species, sometimes identical with the American species." . . . It seems "probable that the African species of these genera (*Copaifera, Drepanocarpus, Sparganophorus, Telanthera, Mohlana, Symmeria*, and *Calathea*) have been brought there by the agency of oceanic currents, winds, etc., from the American continent in bygone ages, rather than that the American species should have been derived from the African, as the numbers preponderate on the American side in all cases where the genus contains several species."

A New North American Fern.—Mr. Geo. E. Davenport communicates to the *Bulletin of the Torrey Botanical Club*, for June, a description, accompanied with a plate, of a very beautiful new fern—a species of *Cheilanthes*, which in honor of its discoverer he has named *Ch. pringlei*. This plant, which was detected by Mr. C. G. Pringle on the mountains of Southeastern Arizona, is said by Mr. Davenport to be, as a species, "one of the most distinct and satisfactory that has been discovered for a long time, and is wholly unlike any known to our flora or heretofore described."

A Large Shad Tree.—In the same journal G. P. Davis, M.D., mentions the discovery by him, in the town of Glastonbury, Conn., of a shad tree (*Amelanchier canadensis*) which had the size, proportions, and general aspect of an uncommonly fine old sugar maple. Its girth was found to be 8 feet 8 inches at 3 feet 6 inches from the ground, and the spread of its branches to be 48 feet in diameter. The tree was in full bloom on the 19th of May.

The Art which Produces a Cabbage.—At a November meeting of the Philadelphia Academy of Natural Sciences, Mr. Thomas Meehan exhibited a specimen of a cabbage which had, before blossoming, grown to the unusual height of three feet, the spiral coil of the stem, which was to the left, having been thus drawn out without any corresponding increase in the number of leaf scars.

The cabbage, in its natural condition, is an insignificant plant without any such head of leaves as makes it of commercial value when cultivated. The desired effect is produced by sowing the seeds of the wild cabbage at a period of the year so late as not to allow the formation of flowers, in which case the vegetative vigor of the plant is expended in the production of the mass of leaves, which become better developed and denser as the process of cultivation continues.

Sense of Direction in Animals.—The remarkable faculty which cats, dogs, pigeons, and other animals possess, of returning in a straight line to a point of departure, has awakened much curiosity on the part of naturalists. Some refer it to instinct, some to intelligence similar to that of man, some to an internal mechanism which makes the animals simply automata; but none of these attempted explanations does anything toward solving the mystery. Wallace supposes that when an animal is carried to a great distance in a basket its flight makes it very attentive to the different odors which it encounters upon the way, and that the return of these odors, in inverse order, furnishes the needful guide.

Toussenel supposes that birds recognize the north as the cold quarter, the south as the warm, the east (in France) as the dry, and the west as the moist. Recently, Viguier has published, in the *Revue Philosophique*, an original memoir upon the sense of orientation and its organs, in which he attributes the faculty to a perception of magnetic currents.

Influence of Electricity on Vegetation.—Mr. Macagno (*fide Les Mondes*) has experimented near Palermo upon the influence of atmospheric electricity on the growth of grape vines. Sixteen plants were submitted to the action of an electric current, by means of a copper wire inserted by a platinum point in the extremity of a fruit bearing branch, while another wire connected the branch at its origin with the soil. The experiment lasted from April to September. The wood of the branches which were experimented upon was found to contain less potash and other mineral matters than the rest of the vine, but the leaves had an excess of potash in the form of bitartrate. The grapes collected from the electrized branches furnished more mast, contained more glucose, and were less acid.

Direct Process for Magnetic Iron Sand.

The production of wrought iron and steel from ore direct, without the intervention of the blast furnace, is a subject constantly occupying the attention of many metallurgists. In the blast furnace two operations are accomplished. First, the removal of the solid impurities in the ore used, by fluxes and in the form of slag. Secondly, the reduction of the oxide of iron it contains, by deoxidation, to the state of metallic iron. This combined operation with the common ores is very efficiently done in the blast furnace, but the resulting pig iron is somewhat impure, containing always a greater or less percentage both of carbon and silicon. For the production of wrought iron these substances have afterward to be removed by the operation known as puddling, which consists of remelting the pig iron with fresh portions of oxide of iron to oxidize and thus remove the carbon and silicon it contains. If, however, an ore of high percentage is taken, composed chiefly of oxide of iron, the production of metallic iron then consists almost entirely in the second process effected in the blast furnace; that is to say, the reduction of oxide of iron by deoxidation to metallic iron. This can be accomplished at a comparatively low temperature—about 800° Fah.—and a higher temperature is only necessary afterward to melt and agglomerate the particles of metallic iron thus formed.

The method of reduction usually proposed in all direct processes is by the admixture of solid carbon, in the form of coal or charcoal, with the iron ore, both being brought into a fine state of division by grinding, in order to cause an intimate mixture of the particles, and thus facilitate the chemical action which takes place. Numerous processes and forms of apparatus have been proposed to effect this object, but the practical difficulties have been threefold. First, the difficulty of bringing the heat to bear on a powder, which, owing, to the interstices between the particles, is always an exceedingly bad conductor of heat; secondly, the prevention of the particles of iron once formed being again reoxidized; and thirdly, the difficulty of getting rid of the solid impurities in the ore, which, when melted, form a highly acid slag, containing a very large percentage of iron.

One of the earliest attempts at the production of pure iron direct was by what is known as Blair's process, modifications of which have formed the basis of many subsequent attempts in the same direction. This process consisted of heating together a mixture of iron ore and charcoal, both finely powdered, in close retorts of peculiar construction. In this way the iron was reduced to a metallic state in the form of spongy iron, which was afterward agglomerated in a melting furnace. The process, however, was abandoned, owing chiefly to the difficulty of the proper regulation of the heat, which was either not sufficient to penetrate to the interior of the retort, or so great as to cause a partial melting of the mixture near the sides, which was afterward removed with difficulty. It was found also that unless the iron ore used was nearly pure, besides being free from phosphorus and sulphur, the loss of iron in the slag in melting was very great, and the quality of the iron itself was defective, being generally what is known as red short.

It occurred to Dr. Siemens that the chief difficulties in the direct process would be overcome by the use of a rotary furnace, which would accomplish the double object of thoroughly exposing the mixture of iron ore with coal or charcoal to the necessary heat by constantly turning it over, and also afterward agglomerate the particles of metallic iron formed in the furnace, by rolling them together while in a pasty, half melted state. In this way balls of metallic iron would be formed, exactly the same way as the operation is done by hand in an ordinary puddling furnace. After many experiments this furnace, which has been previously noticed in our pages, has been brought to work practically on a large scale. The third difficulty, however, was still experienced; the necessity of having, if possible, a pure oxide of iron, which by reason of its containing no solid impurities would form no slag. Attention has lately been turned to the magnetic iron sand deposits which exist in some places on the sea coast in large quantities, especially in Canada on the banks of the St. Lawrence, though generally on the portions of the river, so mixed with ordinary sand as to be with difficulty separated from it. Lower down the river, however, the deposits are more extensive and purer. At Moisic, near the bay of Seven Islands, according to the Geological Report of Canada, there is a continuous broad belt of iron sand on the surface of the beach, some three miles long, and several feet deep, containing equal to 55 per cent of metallic iron, with at the same time a total absence of phosphorus and sulphur.

The separation of these magnetic sands from all their impurities has been recently accomplished by a very ingenious invention of Mr. Edison. This machine is simply a hopper, fixed at an elevation, and so arranged as to allow the magnetic sand it contains, previously dried to prevent any cohesion of the particles, to fall from a long narrow opening at the bottom of it in a thin continuous stream. Electromagnets are placed at right angles to this stream, and so arranged as to simply deflect the grains of magnetic iron when falling, without allowing them to come in contact with the magnets. The magnetic iron thus falls into a receptacle at one side, while the impurities, consisting of sand, titaniferous iron, etc., fall in a direct line, and are thus separated. So complete is the arrangement that a single separator, requiring only a 3-horse power engine to elevate to the hopper and drive the dynamo necessary to supply the magnetic current, will pass through 70 tons a day of sand, giving a product, when fairly pure magnetic sand is operated upon, containing only about 2 per cent of impurity. If passed through a second time, an almost pure magnetic oxide is the result—that is to say, an article containing 72 parts of metallic iron, combined with 28 parts of oxygen. Some of this separated magnetic iron ore, containing about 2 per cent. of impurity, has recently been worked in the Siemens rotary furnace, at the works of the Landore Siemens Steel Company, with the following results:

After a few trial charges, to ascertain the best mixture and most suitable temperature for working this material in the rotator, it appeared that a charge of 25 cwt. of magnetic iron sand, mixed with 6 cwt. of small coal, or charcoal, gave the best results. The whole time required for the operation, from first charging the furnace to withdrawal of the rough, puddled balls, was on an average 3 hours 45 minutes. The yield, in the case of the small coal charges, was about 18 cwt. of rough balls; in the case of charcoal charges somewhat less, or about 16 cwt. The difference in weight may probably to some extent be accounted for by the impurities in the coal, and less perfect decomposition, as compared with the charges made with charcoal. The finished charges usually came out in the form of six or seven balls, some of them weighing over 3 cwt. They were mostly at once thrown, while red-hot, into the Siemens-Martin steel furnaces, and used for making mild steel, for which purpose they were found to be very suitable, and gave excellent results. One of the balls, however, from a charge made with coal, was roughly hammered into an billet, which on analysis gave: Metallic iron, 96·95; slag, 3·04; phosphorus, 0·002; sulphur, 0·03; carbonaceous matter, 0·17; manganese, trace. Probably the small quantity of phosphorus and sulphur contained in this sample was combined with the slag, and would be got rid of by reworking the billet in the usual manner. One of the billets from a charge made with charcoal was afterward reheated, and simply rolled into a finished bar, without piling and reheating again, as usually done. The bar thus obtained was of very fine quality of iron. Upon testing, the tensile strain was found to be 21·5 tons per square inch, with 23 per cent of elongation.

From these statistics it would appear that when working upon pure magnetic iron sand, each of Dr. Siemens' rotary furnaces would produce six charges daily, with a produce of five tons per day of rough puddled bars, or say about thirty tons per week of shingled blooms. The fuel used in the gas generator for heating the furnace comes to as nearly as possible one ton of coal per ton of puddled balls made; and the wages, when working the rotators in pairs, with proper mechanical elevators for charging, would be about six shillings per ton of rough puddled balls produced. It seems probable, from these experiments, that the manufacture of fine qualities of iron and steel will before long be carried out on a large scale in the Siemens rotator, and that pure magnetic iron sand will considerably assist in its economical production. The reduction of magnetic oxide of iron to metallic iron is accomplished more easily, and at a lower temperature, than sesquioxide of iron. Owing also to the fact of the magnetic oxide containing less oxygen than the sesquioxide, it requires less coal or charcoal in the process of reduction to metallic iron.—*The Engineer.*

The Ventilation of Public Buildings.

The failure of systems of ventilation and heating in public buildings is deplorable, not simply because of the injury done to the occupants of such buildings, but because of the influence such failures have in retarding the general adoption of better ventilation and heating for private buildings. If a free use of money with supposed scientific building cannot secure satisfactory ventilation, the argument is raised that a moderate outlay of money superintended by a house carpenter cannot hope to secure this desirable feature. There are valid reasons why buildings constructed at public expense should have the most approved ventilation and heating. That many of them do not, it is not necessary to say.

A common fault in the "system of ventilation" adopted in public buildings is the attempt to make one shaft, in which there is nothing to induce an upward current, remove the foul air from several rooms on different floors. The plan does not secure the most satisfactory removal of foul air from any room, and is fraught with danger because of the liability of the current's being reversed by the opening of a door or window in one of the rooms tapped by the shaft. The result is that the foul air from a series of rooms, instead of being carried out of and entirely away from the building, is carried into one room, the occupants of which may suffer unconsciously. This fault has been observed in a building in which the foul air ducts from a large number of offices and water closets opened into a common shaft tapping five floors. The result is, when the wind is in a certain direction, the foul air from a large number of offices and water closets is forced down the shaft into one room, or, possibly, all the rooms on one floor, from which it has no escape when the doors and windows are closed. The same result follows in buildings where the garret is used for a foul air chamber, into which all the foul air ducts empty, and from which exit is supposed to be provided by one or two large shafts through the roof. In a certain insane asylum, where the garret is used as a foul air chamber, in an examination of the working of the system, by allowing the handkerchief to float over openings of the ducts in the garret floor the handkerchief was drawn down into one of the ducts with great force. On seeking the cause of this reversal of the current, it was found that the patient in the room which the duct was supposed to ventilate had in the night broken the window of the room. The wind, blowing from the opposite quarter, immediately reversed the current, and the accumulated foul air from the garret above had for several hours been turned from its proper channel into the room of the patient.

The difficulties alluded to may be overcome by having a foul air shaft for each room, and having that shaft continue unbroken through and above the roof. In dormitories and asylums, where there are large numbers of rooms, and large numbers of shafts necessary, this may be done without sacrificing architectural beauty, by collecting a number of shafts together into a large, heated chamber, and provide their exits, still unbroken, through the roof, in such places as it may be desirable to maintain the harmony of the design.

A system of ventilation to be most successful needs to be most simple. Each room should have a complete system in itself, not dependent upon the conditions in any other room, so that it could not be deranged by any circumstance in other parts of the building.—*The Sanitary News.*

Increased Speed of Machinery in Factories.

The speed of cotton machinery in Lowell is said to have been increased 30 per cent within twelve or fifteen years. If the city contained no more spindles in 1883 than in 1873, therefore, the production of the mills would still be largely enhanced. In considering the condition of our various manufacturing interests, this matter of higher speed and increased capacity of machinery is, says the *Commercial Bulletin*, often lost sight of, but is certainly worthy of attention in seasons of over-production, like the past six months. There are about 12,000,000 cotton spindles in the United States to-day against 7,000,000 in 1870, but if the speed and capacity per spindle has increased even 25 per cent, the actual productive capacity of the mills has been more than doubled.

And not only has the cotton manufacturing capacity of the United States been more than doubled since 1870, but a glance at the amount of cotton actually consumed by our mills shows an almost equal increase. In the three years 1869, 1870, and 1871 there were consumed in the United States 3,219,000 bales of cotton, or an average of 1,073,000 bales per annum. For the ten months from September 1, 1882, to July 1, 1883, there have been taken for consumption by the spinners of this country 1,988,417 bales of cotton. Very moderate purchases during the next two months will bring the total up to 2,146,000 bales, or just twice as much cotton as was used in the United States in 1870.

In the woolen manufacturing interest very similar conditions are found to exist. A desire to diminish the cost of production has led to an increase in the speed of machinery, and an enhancement of the capacity of the mills in other directions. The loom which formerly run 50 or 60 picks per minute now runs 95 perhaps; and where 40-inch cards were used, many mills now have cards 60 inches in width and of proportionately increased diameters. And yet, in speaking of the number of sets of woolen machinery in the United States, we are accustomed to compare the figures of 1883 with those of 1873 or 1863, without paying attention to any increase which has occurred in the size of the cards or capacity of the machinery during this period.

The effect of lessening cost of production by means of increased speed and machinery of enhanced capacity is not unwholesome. It is in the interest of the consumers, and is therefore eminently altruistic in its tendency. We have merely referred to it as an incident which statisticians frequently lose sight of in calculating the capacities of our mills and factories.

The English Parcels Post.

On August 1 a new parcels post service will be begun, and there can be no doubt that the convenience to the public will be very great. At least the tradespeople throughout England seem quite jubilant over the new regulation. Parcels not exceeding 7 lb. in weight, 6 ft. in girth, and 3 ft. 6 in. in length, may, after that date, be sent by post, at very reasonable rates; and these are liberal dimensions. Nothing is excluded that a respectable person would wish to send, the prohibition only including a few articles damaging to the physical or moral health of the officials and recipients Grouse may be posted from Scotland on the 12th, and no doubt soon after the establishment of the parcels post, says a contemporary, many grouse will come southward.

Live animals and birds are very properly excluded; but a man may post a small leg of mutton or a few bottles of wine, if carefully packed up. An officer will be on duty at the counter of the post office, whose functions it will be to weigh parcels, inform the sender what stamps are required; and the rates "shall be paid by means of postage stamps affixed to such articles, and shall be verified by such officer." Parcels may be addressed to post offices "to be called for," but there will be a charge of a penny a day while they are in the custody of the office.

A Man-eating Mollusk.

A minute pulmonate, Cionella aricula, was not long since reported as occurring in myriads in the cavities of cancellate bones in a prehistoric British cemetery at Chichester. It has now been found of unusual size, by Director Eisher, in human skulls from comparatively recent interments at Bernberg.