[For the Scientific American].

THE SCARABÆIDS.

By Edward C.H. Day, of the Schoolof Mines, Columbia College].

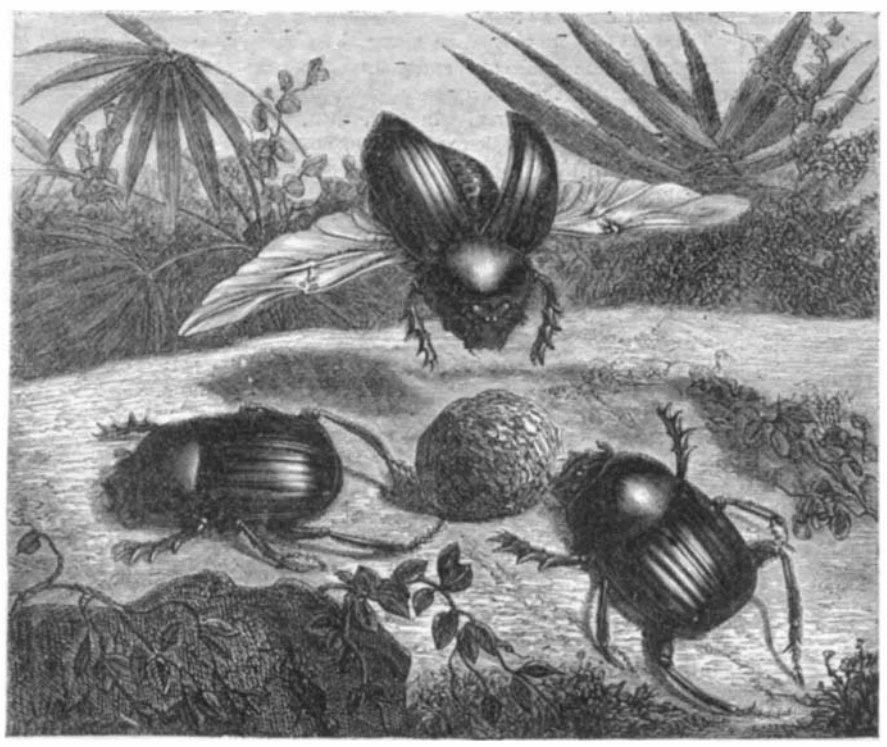
"How disgusting to the eye, how offensive to the smell, would be the whole face of Nature were the vast quantity of excrement daily falling to the earth from the various animals that inhabit it suffered to remain until gradually dissolved by the rain or decomposed by the elements." (Kirby and Spence). Few people perhaps have thought of this forbidding subject from exactly this point of view; yet we may profitably do so, for in nothing is the perfect working of the government of Nature more apparent than in her sanitary arrangements. The familiar illustrations of chemistry will at once recur to the mind of every one; but Nature knows that the operations of that power are sometimes slow, and that delay in effecting the necessary decomposition of worn-out organic matter might result in a widespread and undesirable destruction of living organisms. Moreover the best chemical processes are often accompanied by deleterious vapors, and such are not to be permitted in the natural economy of thickly inhabited districts; therefore Nature has her scavengers, wise beings who do not allow waste matters to lie about, uselessly tainting the pure air, but who turn it at once to some good purpose, and thus lighten the labors of the chemical department. Foremost amongst these useful members of the animal kingdom are many families of insects, and pre-eminent amongst these are the *Silphidæ* or carrion beetles, the *Staphylinidæ* or devil's coach-horses, and the *Scarabæids* or dung beetles. The first mentioned are simply destroyers of dead carcasses, whilst the last confine their labors chiefly to the removal of excrementitious matters. The readers of newspapers will be aware that we have in our cities the exact human counterparts of these occupations, but it is with the *Scarabæids* alone that we have at present to do. An occasion calls for the services of these servants of Nature's sanitary bureau; they are to be found at once on the spot; no excuses for delay are thought of, no jobbery will be winked at; they have the contract, and it will be carried out to the letter. If the weather is extraordinarily warm, extra feet and jaws will be set upon the task; the offensive substance is forthwith removed; it may be buried, it may be eaten, but it certainly is not taken from one place to be dumped in the same objectionable condition elsewhere in a populous neighborhood.

And see how these beetles at once convert it to a purpose useful to themselves and most economical to Nature; they actually make of it an edible nest for their own offspring, and thus raise from it a fresh generation of active, incorruptible scavengers, literally born and bred in the business! This may savor, at first sight, of monopoly—keeping a lucrative occupation in the family—but as the work is always well and honestly done, and this without the public being taxed for it, and as, if occasion requires, other animals may share in the perquisites, no one has any reason to complain.

But this is not the only economy accomplished by these creatures. There are cities in this the nineteenth century wasting all the sewage that should be applied to restore the fertility of the exhausted lands around them; there are farmers in this the age of Liebig and agricultural chemistry who allow the rain to wash the richest elements of their dung heaps out of the farmyard, to be wasted on the roadway or in the bed of the neighboring river; nay, worse, who suffer it to soak away into the family well, letting that which should be converted into food become a secret poison—the source of disease and death. But what a different lesson does Nature teach by her scavengers, who "not only disperse the dung, but actually bury it at the roots of the adjoining plants, and by these means contribute considerably to the fertility of our pastures, supplying the constant waste by an annual conveyance of fresh dung laid at the very root."

The *Scarabæids* have various ways of effecting this dispersion of offensive matters, and of these the most remarkable process, and the most amusing to watch, is that of the tumble bugs. See one after she has deposited an egg within a pellet of horse dung, rolling this ball along, trundling it skillfully with her hind legs, now heaving it, like Sisyphus, to the summit of an eminence, and now, Sisyphus-like, having to follow it down to the bottom, again to recommence the toilsome ascent; now digging under a stone, and with, comparatively speaking, far more than the strength of an elephant, heaving it out of her way, and then working it patiently round an obstacle that she cannot surmount; laboring on until she finally places it in a spot adapted for the security of its precious contents, and you may form some idea at once of the power of an insect's muscles, and of its indomitable industry and patience. If several tumble bugs, as is frequently the case, are at work together, you will learn that they are wise too, wise in the wisdom of unselfishness. No matter whose ball it is an individual comes across, she trundles it along. If she falls into difficulties, the others come to her aid; and if the difficulties prove insuperable, and that ball has to be deserted, she at once sets to work with another. It is as if these creatures said to one another: "What matter whether this ball is yours or mine? We have a common duty to perform; it would be folly for us to do as men do, cling each to his own and leave the rest to fate. The propagation of our race depends upon some eggs being stowed safely away; what does it matter whether they are mine or yours?" It is the story of the ants again; each for the whole community, and not for herself alone; it is the story of all Nature, and man is the only social being that disregards the moral.

It seems almost just that this insect, lowly, and, according to a refined taste, repulsive though its mode of life may be, should have been selected by the ancient Egyptians for the highest honors, though it is hardly probable that the sacred beetle obtained its religious significance from its curious habits. Noel Humphreys says: "With the sacerdotal naturalists of Egpyt, who had carefully observed the habits and transformations of the beetle, that insect became a symbol of the principle of metempsychosis and other theological dogmas;" and in Figuier's "Insect World" we find the following more extraordinary explanation: "Hor-Apollon, the learned commentator on Egyptian hieroglyphics, thinks that this people, in adopting the *Scarabæus* as a religious symbol, wished to represent at once *a unique birth, a father, the world, a man.* The *unique birth* means that the *Scarabæus* has no mother. A male wishing to procreate, said the Egyptians, takes the dung of an ox, works it up into a ball, and gives it the shape of the world, rolls it with its hind legs from east to west, and places it in the ground, where it remains twenty-eight days. The twenty-ninth day, it throws its ball, now open, into the water, and there comes forth a male *Scarabæus.* This explanation shows also why the *Scarabæus* was employed to represent at the same time, a *father*, a *man*, and the *world.*" If the priests really believed that the *Scarabæi* were all males, it does not speak much for their powers of observation; if they did not believe it, then Hor-Apollon's statement gives them credit for a wonderfully inventive imagination. We incline to the latter alternative. There are at least two species of *Ateuchus* figured on Egyptian monuments; the one here represented the *Ateuchus sacer*, common in the countries around the Mediterranean, a black insect; and the other the *A. Egyptiorum*, an insect of brilliant metallic green color, more rarely found and more exclusively African.



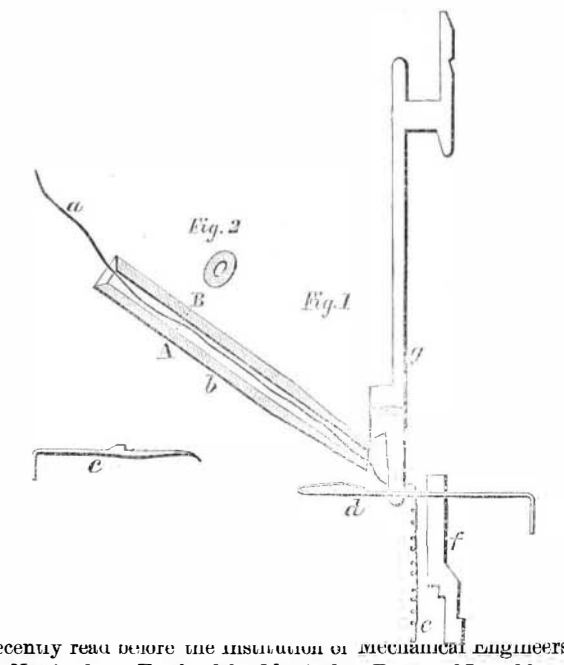
NATURE'S BOARD OF HEALTH—HER SCAVENGERS.

Knitting Machinery.

The following is an abstract (from *Engineering*) of a paper recently read before the Institution of Mechanical Engineers, at Nottingham, England, by Mr. Arthur Paget, of Loughboro:

"In introduction of the subject the author stated that the date at which the appliances for knitting had been brought within the limits of machinery as strictly so called, was very recent, and the subject of knitting and machinery for that purpose had been so much out of the pale of mechanical science that some explanation was necessary as a preliminary showing the nature of the structure of knitted web. This was done by the aid of diagrams, and it was remarked that in most knitted articles it was necessary that the web, as it was made, should be shaped during the process of making the web from the thread or yarn, and this was one great peculiarity of the hosiery manufacture, that shaped wearing apparel, comprising the numerous descriptions of underclothing, was produced direct from the yarn at one operation of the machine, and without the intervention of the tailor or milliner; and the weaver of calico cloth, or other such fabrics, would hardly realize at once the enormous amount of detail which this peculiarity entailed in the manufacture of hosiery to suit all the different shapes and qualities required, and the consequent necessity that the machines employed should be easily adapted to make articles of very great variety of shapes, thickness, and degrees of elasticity. The framework-knitter's old hand frame, though now doomed to the same fate as many other clever contrivances of former years, was even yet in this district the means of producing probably the larger part of the hosiery made. The subject of the present paperwas the self-acting power frame, three specimens of which were exhibited to the meeting.

"To enable the construction of this machine to be more readily understood, the author stated that it would be desirable, first to consider the five primary parts by which the operation of knitting the thread into web is performed, and then to explain the manner in which these several parts had the proper movement imparted to them Still further, to facilitate the comprehension of the movements of the machine, there were distributed to the members present cards having fixed upon them in their proper relative positions specimens and drawings of the primary parts just referred to. From one of these cards the accompanying sketch has been prepared, *a*, in the diagram, being the thread; *b*, the thread tube; *c*, the "coverer"; *d*, the needle; *e*, the knitted web; *f*, the "knocking over bit"; and *g*, the sinker. By the aid of this diagram it may, perhaps, be possible to give a general idea of the action of the machine, which was fully and clearly described by the author in his paper, an extensive series of diagrams, showing the various parts in the positions they successively assume, being employed to illustrate the matter.



"In the annexed sketch the knitted web is shown hanging on the needles, which are fixed side by side in a row of the necessary length. The thread tube has a motion to and fro across the needles, and the thread deposiitted by it is carried down between the needles by the sinkers, so as to form a series of loops. The sinkers are of thin steel, and they are arranged so that they can rise and fall between the needles. The line of thread having been deposited over the needles, the latter retire, and the new loop over each passes under the barb or part of the needle which is turned over. Later on, a presser bar descends and closes this turned over portion, so that its point enters into a groove formed in the top of the needle to receive it; and the retiring motion of the needle still continuing, and the sinker being raised, the old loop on the needle is by the action of the "knocking over bit" caused to pass over the closed barb of the needle, and thus over the new loop (which is inclosed within the barb) also. The sinker then descends again, and the web being then between it and the "knocking over bit," is held close to the latter as the needle advances with the barb released, the new loop being thus made to take up the position occupied by the old loop at the commencement of the circle of operations. The manner in which the primary parts above referred to have the requisite motion given to them, was fully described in the paper.

Having explained the mode of making the web, the author next described the operation of varying the width or narrowing. This is effected by withdrawing two needles at a time, at various intervals. The elasticity of the web prevented any appearance of sudden step instead of a suitable curve. The essential principle of narrowing is that the two loops to be narrowed are moved from two needles at the edge of the web, and are transferred to the two needles next to them and nearer to the centre of the width of the machine. Thus these two needles have each two loops upon them, and one of the loops of the next row is then drawn through each of these pairs of loops, and the loops which would otherwise have run down are held secure. The transferring of the loops from one pair of needles to the next pair is effected by means of the coverers, which are grooved on their under side so as to fit over the barbs of the needles. To effect the transfer of the loops two coverers at each edge of the web are advanced towards the corresponding needles so to take the loops off them. They are next drawn back and moved lateraly so as to come opposite the needles on which the loops are to be deposited, and they are then moved forward to these needles and caused to place the stitches on them.

"Having described the above mentioned operations, the author went on to state that the shaping of the articles was

governed by the employment of a peculiar form of endless chain, commonly known in France as the *chaine Vaucauson.* This chain is advanced one link at the formation of each row by the machine, and at proper intervals links of peculiar shape are introduced, which, by acting on inclines, throw out of action the cams moving the needles, and bring into action those working the "coverers," the first mentioned cams being brought into action again as soon as the narrowing has been effected. A link of special form also is used to stop the machine on the completion of a piece of work. The speed of work, as compared with the older methods of knitting, was shown by the fact, as the author believed, that a skilled knitter, with the ordinary knitting pins, would knit about 60 stitches or loops per minute in knitting the leg of a stocking, and a skilled framework knitter, with his hand frame, will knit on the same work 5,400 stitches per minute, whereas a girl, will on the same work, attend to three of the self-acting machines, each making 50 courses per minute, of 13½ inches wide, and 20 stitches to the inch, thus making 40,500 stitches per minute.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Copper Poisoning.

MESSRS. EDITORS:—The following notes taken from my case book (stated in the Baltimore *Medical Bulletin,* April, 1870), may, as other similar cases, serve as a caution against the use of brass or untinned copper cooking utensils:

March 14, 1868, seven persons—five being adults—soon after eating for dinner, in a public house, stewed fruit (dried peaches) that had been cooked in a brass kettle, were attacked with the following symptoms: Pain in the epigastrium extending over the abdomen, nausea, violent vomiting in some cases, and diarrhea. In some, the gastric distress was extreme, followed by giddiness and depression. All recovered, or nearly, within thirty-six hours. All those, and those only, who partook of the fruit were attacked and had the same symptoms.

Two ladies, of the above sick number, of undoubted veracity, one of whom superintended culinary affairs, stated that the peaches after being cooled were removed from the fire and not suffered to remain in the vessel, which was previously well cleansed. This fact, which is remarkable, is mentioned to show the possibility of accident, even when care is used with a view to prevent it.

Being requested by the proprietor to subject the fruit left over to chemical examinaion, this was done with the following result: First, the peaches not cooked, of the same lot which had been stewed, were examined for copper, but none was detected; iron found in large proportion, this being a normal constituent of organic matter generally, especially so with peaches. The peaches of the same lot which had been used for the table (all having been cooked in the brass kettle) were next examined, when copper was found in small proportion, this accounting for the symptoms. No arsenic, no antimony, no hydrocyanic acid. For the last substance, however, an examination was unnecessary, it being so volatile, if ever present, as to have been dispelled by the heat previously employed; moreover, the symptoms were unlike the effects of prussic acid. In searching for copper, ferrocyanide of potassium and the iron test were chiefly relied upon; for antimony, Marsh's test; for arsenious acid, Reinsch's and Marsh's tests.

Snow Hill, Md. MEDICUS.

Moon Fallacies.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of Aug. 6th, on page 86, you publish an article under the caption of "A Moon Fallacy Exposed," taken from the *American Builder.* The writer quotes from M. Dechamel, a celebrated French agriculturist, which ought to be good authority; but whether the moon has any influence on the timber being cut in the different phases of that planet or not seems to be the question under discussion.

Certain facts relative to this matter have come under my observation so forcibly that I am inclined to think there is some truth in what are termed "fallacies" on this subject. Whether the moon exerts this influence or not, I do not pretend to argue; but I am quite certain if hickory timber, for instance, be cut between the full and new moon, the worms will devour it; but if cut, say three days after the new moon, up to within three or four days before the full moon, the worms will not touch it.

Let some of your country correspondents give this matter a trial. Cut a stick of hickory, say three or four days after the full of the moon, and then cut another stick of the same kind of wood, say three to four days after the new of the moon, and set these sticks up side by side for a few months, and then let us hear the result.

I venture to say, the former of these two will become worm-eaten, and the latter will show no signs of worms or wood borers. Several other facts that would be classed as "moon fallacies" have came under my observation; but let the above suffice for the present. D. A. M.

Cincinnati, Ohio.

A New Trade---Fish Oil.

MESSRS. EDITORS:—The Californian, Connecticut, and Massachusetts newspapers have been congratulating their countrymen that a "new trade" is open to them for the manufacture of the above oil, alleging as a reason "the desertion of the sardine, mackerel, etc., from the coasts of France and Spain," and "the export thereto of roes and spawn from the United States."

The true state of the case is this: Liverpool (and the neighborhood) is famous for its soap manufactories, and turns out some 50,000 boxes *weekly.* Common fish oils, when obtainable, are largely used in fabricating soft, and cheap hard soaps. Our people suggested to the French and Spaniards that instead of packing the sardine for edible purposes only, they should press them into oil with the spare roes of any other fish that could be procured, and consign to England for sale and a market. The hint was carried out so successfully that within these last twelve months, 1,000 tuns of sardine, and other fish oil have come to this market, and have sold readily at £33 and £35, equal to $160 and $168, gold, per tun of 252 gallons (nine pounds per gallon). This new application of the sardine has competed so completely with its previous use for the table, that enough fish are not to be got for "casing," and the dearth now in France and Spain is not that the production is *less,* but that the consumption is *more.* Hence the demand for American roes.

There is therefore vast scope along the almost unlimited American coast for the catch and press of any amount of fish and roes; and be the oil ever so inferior, we can take it at about the quotation given. In this, then, there was just cause for the congratulation referred to, and the soapers of this country will be glad to welcome any quantity of common fish oil that the producers of the United States can remuneratively send them.

Liverpool, England. A. M.

Balancing Cylinders.

MESSRS. EDITORS:—I see by the SCIENTIFIC AMERICAN, of August 13, that C. E. M., of N. Y., like many others, does not quite understand why his shaft, being balanced, should shake so.

Now, let us suppose we have a cylinder four or less feet long and twelve inches in diameter, built of staves on iron rings, the same as a thrashing machine cylinder or a card cylinder. We will suppose that when built it is perfectly balanced. Now let us bore a hole in the end of a stave at one end of the cylinder, and put into the hole so bored one pound of metal; then the cylinder will be so much out of balance. Now we will bore a similar hole at the other end of the cylinder, but on the opposite side. Now, if a similar piece of iron or metal of same weight be inserted it will be balanced again if laid on level, parallel steel bars, but will be out of balance while running; and this is what ails his shaft.

The only way that I have found successful is to balance while running, or rather to test while in motion. If pulleys have much force and high speed they will require to be balanced in the same way. W. O. JACOBI.

Mellenville, N. Y.

[Our correspondent would add much to the value of his communication if he will explain how, unless centrifugal force acting unequally on the opposite sides of the cylinder destroys its regular form, the cylinder will, after being balanced as described, be out of balance when running. Also, if he would give his method of balancing or testing cylinders while running. The first will be a theoretical point of interest to many who will disagree with his conclusions. The second is a matter of practical importance. If cylinders can be so balanced—which we doubt—the mechanical world would like to know it.—EDS.

New Bread.

MESSRS. EDITORS:—Your paper of the 13th of August had an article headed "New Bread," asking why it is unwholesome. The true answer to this question is, I conceive, to be found in an account, published some years ago, of some experiments made upon the soldier St. Martin, a part of whose stomach was shot away, leaving an opening by which food could be introduced, and the process of digestion watched and carefully noted. In new bread the process of fermentation is checked, but not entirely stopped, by the drying out of the moisture in baking. It appeared from the experiments on St. Martin that when new bread was introduced into his stomach the heat and moisture caused the fermentation to recommence before the process of digestion had commenced, greatly interfering with it. W.

Screw-Holes in Cast Hinges.

MESSRS. EDITORS:—Can manufacturers of cast butt hinges be induced to diminish their sales and benefit the public by diminishing the number of screw holes in their hinges?

The breaking of a cast hinge is a common occurrence—the breaking or wrenching out of a screw is rare.

Three holes in an ordinary shutter hinge, for example, will, by so decreasing the strength of the hinge, cause it to break from a strain that would be harmless if there were only two screw holes. A great saving in screws and labor would also be effected. WM. C. BUTLER.

Sassafras, Md.

Dyeing Wood.

MESSRS. EDITORS:—In No. 4, present volume of the SCIENTIFIC AMERICAN, one of your readers asks for a method of dyeing some of the lighter colored and cheaper woods to the natural color of walnut. Here is the process which Mr. J. B. Rochard, a French carpenter, used while working in Paris. Take green husks of walnuts (Brou) and put them to macerate in water for say fifteen days. At the end of that time boil them a little in the same water. Let the decoction cool, and use it by soaking a piece of rag in it and rubbing the surface of the wood with it. Two rubbings will give to the wood the color desired. When wanted to dye hard wood, like oak, rub the wood previously with salt of niter and proceed as before.

Jacksonville, Fla. F. GUICHETEAU.

Lowest Line of Perpetual Snow.

MESSRS. EDITORS:—In your number of August 6th, page 85, is a communication on this subject, indicating that there is something like a uniformity in the snow line in the same latitude, whereas the fact is quite the reverse, depending on a great diversity of circumstances.

On detached high peaks, like Teneriffe, it descends low for the latitude. On the Himalayas, it descends lower on the south side where the descent is abrupt, than on the north where the descent is less, and to an elevated extended table land.

And do we not see the same thing in America? The line of perpetual snow descends lower on Mount Hood and other peaks of the Cascade and Nevada range, with its abrupt western slope, almost to the ocean level, than on the peaks and ranges of the high table land of the Rocky Mountains.

And though the temperature on the west sides of the great continents is much milder than in the interior and on the east sides on lower lands, does that apply to the same degree at high altitudes? My impression is that it does not.

Grand Rapids, Mich. JOHN BULL.

Tin Fruit Cans.

MESSRS. EDITORS:—There are various qualities of tin purchased by fruit packers for manufacturing their cans. You probably know as well as any one of what the coating of that tin consists, whether it is all pure tin or a mixture of tin and lead. I have several times eaten peaches which had a decidedly metallic flavor, and have suspected that it was derived from the coating of the cans. I have reason to think that packers use the cheapest grade of tin for fruit, and that they use different grades for oysters and vegetables. A. B.

Balancing Pulleys and Shafting.

MESSRS. EDITORS:—If C. E. M., of N. Y., will take his pulleys from the shaft, and balance each one separately, he will have no further trouble with their shaking, if the shaft is of proper dimensions.

In my opinion, the trouble will be found in this, that the maker of the machine balanced the pulleys on the shaft. This practice is all wrong. Work balanced in this way will not run steadily. J. G. F.

Winchendon, Mass.

How the Dead Soldiers are to be Identified.

A Berlin letter says: "Mark one instance of the German practical spirit as a proof of the fashion after which these Teutons prepare to fight. In recent wars popular feeling has demanded that rank and file, captains and generals, shall be equally and impartially mentioned in the lists of the slain; but difficulties have arisen, because the enemy cannot know the dead men's names, and when the muster roll is called after battle, the missing may be only wounded or prisoners. Germany has in her solid, calm manner, arranged, in view of this difficulty, that each wife and mother shall speedily know the best or the worst about those who go to fight 'with God, for King and Fatherland.' Slips of parchment, like luggage labels have been prepared, on which the number of each German soldier is plainly written, and one of these will be fastened inside his coat when he goes into action. After the day is decided, the enemy, if he be master of the field, will be requested to collect and return these labels, of which about a million have been provided, grim tickets for an unknown journey! Think of the German wife or mother sewing it on—the battle ticket of her stake in the quarrel—the address of her particular 'material of war,' the awful traveling label whereon no loving hand may write 'with care,' seeing that its bearer goes into the Valley of the Shadow, to come forth again or not as Heaven shall decree. Sewn on with German thread, ripped off, perchance, with French knife, whole packets and parcels of these little human memoranda will surely be returned; but yet every man who buttons his coat over the label of death has looked his fate full into the face, and made himself 'ready for the burial.'"

The Fly-catching Plant.

In an article on "Flowers in Paris" in the last number of *London Society,* the writer says:

"A very curious fly-catching plant, flowered in my garden this summer, and a most curious inflorescence it is. The Corsican arum, *Arum crinitum* or *muscivorum,* called by French gardeners *gouet-chevelu* and *Attrape-mouche* (please not to confound this either with the Dragon or Italian arums, *A. dracunculus* and *Italicum*), produces a flower like the common arum of the hedges, only much larger, and with the upper part bent downwards, as if it were an accidental distortion. Both the central spadix and the spathe are thickly covered with dull purple bristles (whence its name *crinitum* and *chevelu*).

"The spathe contracts towards the base, like an hourglass, and there issues from it a faint cadaverous smell. This attracts blow-flies, blue and green. They come accordingly, not in swarms, but one by one, leisurely and taking it easy; and there are no outward and visible signs of their being caught.

"You skeptically ask yourself why the plant is named *muscivorum* or *attrape-mouche.* By-and-by, perhaps, when the spathe is shriveled, you tear it open to see whether you have any chance of obtaining seed, and the secret is revealed. At the bottom you find dead flies by scores, beguiled into a sort of vegetable Black Hole of Calcutta. Like the animals that entered the lion's den, all their footsteps pointed inwards; none came out; the bristles prevented them.

"Another year, I should like to try whether those bristles have any motion of irritability, or power of entangling and shutting in their victims."