good food and drink, more cleanliness and good companionship to prevent mental depression and discouragement, with rest, are the medicines now fast becoming popular; and they are so good to take, that they are gratefully received rather than rejected by the sick.

It is true that antidotes to certain blood poisons have been found (quinine seems to be such an antidote), though the real nature of the poisons is yet unknown. In cases where such antidotes are ascertained, it may be wise to use drugs, though we cannot explain how they act to remove the cause of the malady; but there are comparatively few such remedies in the *materia medica*. Indeed, it has been one of the articles of faith of the allopathic school, that there is no such thing as a specific remedy. We believe that this dogma is destined to be replaced by just its opposite, namely, that any drug, in order to be styled a remedy, must be demonstrated to have a specific action upon the disease for which it is administered.

The present state of medical science is the natural result of the general progress of the time. Old superstitions are recognized in their true character through the light of modern science. The microscope, the spectroscope, the chemist's paraphernalia have given us some insight into the action of certain substances when introduced into the human system, that shows the belief in their efficacy to be unfounded. Through chemistry the science of pathology and therapeutics will advance, but the latter will doubtless advance by the elimination of a vast number of the agents hitherto employed in the healing art. If new ones are added, it will be on grounds more scientific than the blind empiricism of the past. Empiric conclusions hereafter must be of that positive character which leaves no room for doubt; and though sickness can never be pleasant, the coming sick man need not fear that artificial horrors will be added to the couch of pain, through the administration of nauseating medicines of uncertain value, and the deprivation of all external appliances that can sooth and comfort, and reconstruct his shattered system.

If he is thirsty, he will have cool drinks. He will have a nice clean bed, well aired. His parched skin will be well washed with pure water. His room will be thoroughly ventilated and infected. Instead of depletion by blistering, bleeding, and purging, he will be treated to nourishing and easily digested broths and viands; and regard will be paid to what were once called his abnormal cravings and desires. His apartment will, in short, be made a haven of peaceful rest, into which he puts for repairs, and from which, if not a total wreck when he enters it, he may emerge patched up in the most scientific manner, by the same hand that built him--Nature--the good old architect, who knows what she is about, and only asks, of doctors and nurses, that they should clear away the rubbish and let her have her own way in the matter of healing.

THE STUDY OF ALLOYS.

We have repeatedly called attention to the great importance of the systematic study of alloys, and have pointed out that the only way, to prosecute such a study with any hope of success, is in a well endowed metallurgical laboratory, supplied with ample apparatus, and a zealous corps of thoroughly trained investigators; the researches to be continued, if need be, through half a century, or until the field has been thoroughly worked over. The subject is so extended that few investigators will attack it single handed, except to make disconnected and unconclusive experiments. We have never realized this truth so forcibly as when reading Fesquet's translation of Guettier's "Treatise on the Manufacture of Alloys," which has recently been forwarded for notice by the publisher.*

In the introduction to this work, the acknowledgment of incompleteness is frankly made, and the impossibility of a strict and exact method is confessed. In the present state of knowledge upon the subject of alloys, we grant the impossibility, but are not willing to concede that our knowledge might not be so extended as to form a solid basis for such a method. Surely the number of possible combinations of metals is not so great as those of organic substances, nor are their properties so various. Yet we have an exact method in works on chemistry.

We object also to the classification of metals, adopted in the work, which is utterly unscientific. That the reader may understand the ground for this objection, we give the classification as found on page vii of the introduction:

1st. The metals especially industrial, that is to say, those which are most in use in all kinds of manufactures. They are: Copper, tin, zinc, lead, iron, steel, etc.

2d. The metals which belong to the arts, but whose importance is secondary. These are: Bismuth, antimony, nickel, arsenic, and mercury.

3d. The precious metals which belong to the arts, or more particularly to the manufacture of objects of luxury. These are: Gold, silver, aluminium, and platinum.

4th. The metals scarcely used in industry or in alloys. most of them being, at present, without any clearly demonstrated usefulness.

For the purposes of the work, this classification answers tolerably, but it fails to give the reader any idea of those properties possessed in common by certain metals, by which chemists have agreed to group them in classes. Without keeping these groupings constantly in view, we believe no study of alloys can be pursued that will be important to science. Isolated discoveries of peculiar combinations are possible, and, from time to time, will be made, but these discoveries can never lead to generalizations, and our knowledge will therefore remain in the crude, uncompacted state, of which this book is a striking example, until some such course as we have recommended be adopted.

We find nowhere in the work a definition of the term alloy, and though a distinction is made between alloys formed of definite proportions, (chemical alloys), and those which are defined by Mathiessen to be solidified solutions of metals in other metals, this distinction is nowhere sharply defined. In short, the reader may arise from the perusal of this book with scarcely more theoretical information than he had at the beginning.

If this criticism seems severe, we will strive to do equal justice to the merits of the work, which are so numerous as to render it of very great general value. As a practical guide which is all that is claimed for it in the title, it is far superior to anything we have ever met upon the subject. In fact, we do not believe another work exists, to which engineers, artizans, manufacturers and inventors, can turn with full confidence for the instruction afforded in this treatise. To the brass and iron founder, the model maker, the general mechanician, its aid must prove invaluable, especially that found in the chapter on the "Preparation and Composition of Alloys," which, if properly studied, is a chart by which the errors of inexperience may be easily avoided. The method of procedure is of great importance in the production of many valuable alloys. To throw the metals together hap-hazard is, in most cases, to insure failure. We are often asked by correspondents to set them right in matters of this kind, and know how general is the want of accurate information upon the subject.

The following quotation will illustrate more fully the necessity of pursuing a definite routine in the admixture and combination of metals:

"In general, it is advantageous to introduce into the alloys a certain number of elements, even in small proportions for many of them, and although several of these elements would not appear to possess an appreciable utility, or have an important effect. The results of affinity obtained by the new elements favor the mixtures, increase the density and the homogeneousness, at the same time that they sometimes counterbalance, with great advantage, the tendency to liquation or separation in the melted mass.

"Thus, for instance, a statuary bronze, which could be made entirely of copper and tin, acquires new and indispensable qualities by the addition of zinc and lead, even in small proportions.

"As another example, the alloy of copper and zinc, which as such might be suitable for certain uses in the arts, becomes much more valuable for these same uses, and is improved and completed, by the addition of a small proportion of tin or lead.

"The more complex an alloy is to be, the more important is it that its preparation should be effected by the union of more simple alloys, previously made. Outside of the considerations which guide the founder as to the order in which the metals should be melted, such as the peculiar conditions of affinity, the similitude in the specific gravities and the points of fusion, it is proper to examine the means and processes by which we add, to the final melting, those metals whose proportions in the alloy are comparatively small."

Of scarcely less value is the discussion of the properties of special alloys, and their applications to useful purposes in the arts. The list is very full, and the proportions are in all cases fully stated, and, when necessary, special directions are given. It would be strange if some alloys of recent date, and not yet generally introduced, had not been omitted, yet we have been able to recall very few not comprised in this department of the work.

*A Practical Guide for the Manufacture of Metallic Alloys, Comprising their Chemical and Physical Properties, With their Preparation, Composition and Use, Translated from the French of A. Guettier, Engineer and Director of Foundries, Author of "La Fonderie en France," etc., etc. By A. A. Fesquet, Chemist and Engineer. Philadelphia; Henry Carey Baird, Industrial Publisher, 406 Walnut street. London; Sampson Low, Son & Marston, 188 Fleet street. 1872. Price by mail, postage free, $3.00.

ARTIFICIAL FUEL.

We publish, in another column, the report of a committee of the Franklin Institute on a trial of artificial fuel. In connection with this report, some general remarks upon the subject may be useful.

It is commonly supposed that the primary object, in the production of artificial fuel, is the utilization of waste; but there are other important ends that may be secured, which ought not to be lost sight of in the general consideration of the subject. One of these is the production of fuel better suited to certain industrial operations than that obtained in the crude form. The process of coking coal for iron working is a striking example in point. By this process, the sulphur, in the coal, which is injurious to iron is removed, and the coke is made to approximate in purity to charcoal, with which the best iron is made.

The manufacture of charcoal is another familiar example of the artificial preparation of fuel. By this process, we get a fuel which burns with scarcely any smoke, is free from substances contained in the natural wood, and is thereby much better for many uses than wood previous to distillation.

We see then, that the artificial preparation of fuel does not necessarily look to cheapness as the sole end to be secured; in fact, this point may, in some cases, be entirely ignored with a large demand for the fuel produced, provided it has qualities that compensate for increased cost. To utilize waste and thus make a cheap fuel is, however, the chief end sought by inventors, who aim at reducing coal slack to a form convenient to use for domestic or manufacturing purposes.

There are, probably, very many ways in which this may be done, not yet hit upon by inventors. The one described, in the report alluded to, is undoubtedly a good one, and there are others in use which give excellent results. One important thing in domestic fuel is that it shall be comparatively free from dust. A slight increase in the percentage of ash is not to be regarded as a serious defect. Such increase gives little trouble, and does not lessen greatly the heating capacity of the combustible ingredients. It adds a little to the trouble of attending fires, but this is a trifling inconvenience.

We believe that the form of the lumps or blocks of artificial fuel is a matter of more importance than it is generally considered. If made with sharp corners and angles, as is usual, these corners break and crumble in handling and transportation, and a disagreeable and filthy dust is created, which might, we think, be avoided in a great measure by a different form. Some of this kind of fuel is also not sufficiently dense to make a fire that will keep sufficient time. Others are not sufficiently tenacious in texture to prevent crushing and crumbling.

In short, there is still room for much invention in this department, and we look to see the manufacture of artificial fuel take its place, in the future, among the great industries of the world.

THE AMERICAN MASTER MECHANICS' ASSOCIATION.

This association is proving itself a really working organization, and is as ably managed as anything of the kind in America. At its last annual convention, September 12, 13, and 14, 1871, held at Louisville, Ky., some very able papers were read, and much valuable information elicited. The following list of subjects for discussion shows that the association means business. The selection is most judicious, including

Boilers and boiler material.

Boiler incrustation.

Boiler explosions.

Safety valves.

Construction of valves and valve gearing.

Steel tires.

Best method of securing driving and truck brasses.

Best method of constructing tender trucks.

Is there any method or device for packing stuffing boxes, more economical than hemp?

Application of compression brakes.

Comparative performance and cost of operation of eight and ten wheel engines for freight service.

Comparative performance and cost of operation of ten wheel engines with six drivers coupled, and eight wheel engines with four drivers coupled.

Uniform system of computing mileage of engines doing switching service.

Uniform system of examination for promotion of locomotive firemen.

Advisability of establishing different grades of locomotive engineers according to length of service, character, etc.

THE AGASSIZ EXPLORING EXPEDITION---INTERESTING RESULTS ALREADY OBTAINED.

We recently chronicled the departure from New York of a deep sea exploring expedition, under the lead of the venerable Professor Agassiz, on a voyage round the world, authorized by the United States Coast Survey. We are already beginning to receive interesting accounts of results obtained by members of the expedition, some of which are narrated in the following interesting letter:

ST. THOMAS, W. I., Dec. 15, 1871.

PROFESSOR AGASSIZ TO PROFESSOR PIERCE.

My Dear Professor—For several days after we left Boston, I was greatly troubled by a sense of general weakness, so much so that more than once I thought I had undertaken more than I had strength for. But as soon as we got into warmer latitudes, I felt better, and now I am actually improving beyond my condition at the start. As soon as we reached the Gulf Stream, we began work. Indeed, Pourtalès organized a party to study the temperatures as soon as we passed Gay Head, and he will himself report his results to you, which are quite interesting. My attention was entirely turned to the Gulf weed and its inhabitants, of which we made extensive collections.

SEA WEEDS AND THEIR INHABITANTS.

Our observations favor the view of those who believe that the floating weed is derived from plants torn from the rocks, upon which sargassum naturally grows. I made a very simple experiment, which seems to me to settle the matter. Every branch of the sea weed which is deprived of its floats at once sinks to the bottom of the water, and these floats are not likely to be the first parts developed from the spores. Moreover, after examining a very large quantity of the weed, I can say that I have not seen a branch, however small, which did not exhibit distinct marks of having been torn from a solid attachment. You may hardly feel an interest in my zoölogical observations; but I am sure you will be pleased to learn that we had the best opportunity of carefully examining most of the animals known to inhabit the Gulf weed, and some which I did not know to occur among them.

DISCOVERY OF FLOATING FISH NESTS.

However, the most interesting discovery of the voyage thus far is the finding of a nest built by a fish, floating on the broad ocean with its live freight. On the 13th of the month, Mr. Mansfield, one of the officers of the Hassler, brought me a ball of Gulf weed, which he had just picked up, and which excited my curiosity to the utmost. It was a round mass of sargassum, about the size of two fists, rolled up together. The whole consisted, to all appearance, of nething but Gulf weed, the branches and leaves of which were, however, evidently knit together, and not merely balled into a roundish mass; for, though some of the leaves and branches hung loose from the rest, it became at once visible that the bulk of the ball was held together, by threads trending in every direction among the sea weeds, as if a couple of handfuls of branches of sargassum had been rolled up together with elastic threads trending in every direction. Put back into a large bowl of water, it became apparent that this mass of sea weeds was a nest, the central part of which was more closely bound up together in the form of a ball, with several loose branches, extending in various directions, by which the whole was kept floating.

A more careful examination very soon revealed the fact that the elastic threads which hold the Gulf weed together were beaded at intervals, sometimes two or three beads being close together, or a bunch of them hanging from the same cluster of threads; or they were, more rarely, scattered at a greater distance one from the other. Nowhere was there much regularity observable in the distribution of the beads, and they were found scattered throughout the whole ball of sea weeds pretty uniformly. The beads themselves were about the size of an ordinary pin's head. We had, no doubt, a nest before us, of the most curious kind; full of eggs too, the eggs scattered throughout the mass of the nest and not placed together in a cavity of the whole structure. What animal could have built this singular nest, was the next question. It did not take much time to ascertain the class of the animal kingdom to which it belongs. A common pocket lens at once revealed two large eyes upon the side of the head, and a tail bent over the back of the body, as the embryo uniformly appears in ordinary fishes shortly before the period of hatching. The many empty egg cases observed in the nest gave promise of an early opportunity of seeing some embryos freeing themselves from their envelopes.

THE EGGS HATCH OUT.

Meanwhile, a number of these eggs with live embryos were cut out of the nest and placed in separate glass jars to multiply the chances of preserving them, while the nest as a whole was secured in alcohol, as a memorial of our unexpected discovery. The next day I found two embryos in one of my glass jars; they occasionally moved in jerks, and then rested for a long while motionless upon the bottom of the jar. On the third day I had over a dozen of these young fishes in my rack, the oldest of which begin to be more active and promise to afford further opportunities for study. The pigment cells of a young *chironectes pictus* proved identical with our little embryos. It thus stands as a well authenticated fact that the common pelagic *chironectes* of the Atlantic (named *chironectes pictus* by Cuvier), builds a nest for its eggs in which the progeny is wrapped up with the materials of which the nest itself is composed; and as these materials are living Gulf weed, the fish cradle, rocking upon the deep ocean, is carried along as an undying arbor, affording at the same time protection and afterward food for its living freight.

This marvelous story acquires additional interest if we now take into consideration what are the characteristic peculiarities of the *chironectes*. As its name indicates, it has fins like hands; that is to say, the pectoral fins are supported by a kind of prolonged, wristlike appendages, and the rays of the ventrals are not unlike rude fingers. With these limbs these fishes have long been known to attach themselves to sea weed, and rather to walk than to swim in their natural element. But now that we have become acquainted with their mode of reproduction, it may fairly be asked if the most important use to which their peculiarly constructed fins are put is not probably in building their nests.

LOISEAU'S COMPRESSED FUEL.

HALL OF THE FRANKLIN INSTITUTE, PHILADELPHIA, DECEMBER 19, 1870.

The committee on science and the arts, constituted by the Franklin Institute, to whom was referred for examination specimens of artificial fuel, prepared by Mr. E. F. Loiseau, of Philadelphia, have made the following report:

That they have made trials of the samples produced from anthracite and from bituminous coal.

The mode of manufacture, as related by Mr. Loiseau, is as follows:

1. Anthracite small coal and dust were mixed with (7) seven per cent of clay, and compressed into cylindrical molds about $4\frac{1}{2}$ inches in diameter and 4 inches deep, or else into spherical masses about 3 inches in diameter.

2. The molded masses are placed for a few minutes in a bath of benzine, in which rosin had been dissolved, and from which they are removed, and dried by an exposure to a current of air.

The object of coating them with a film of rosin is to prevent the absorption of moisture and consequent softening of the clay; the solution in benzine penetrates the mass of coal and clay to a depth of about $\frac{1}{4}$ inch, and so efficiently closes the crevices, that samples immersed in water for twelve hours were found dry in the interior when broken up for examination.

Both the anthracite and bituminous fuels were burned in a furnace measuring 9 inches in diameter and 7 inches in depth; each variety of fuel burned freely, and was completely ashed, but the intensity of the combustion was less than that produced by anthracite or bituminous coals of small size, burned in the same furnace. These comparisons were made with a moderate and also with a strong draft.

The average amount of ash obtained from the anthracite artificial fuel was 16 per cent, and, from the bituminous artificial, was 18·5 per cent.

The heating powers, as obtained from trials in Thompson's apparatus, are as follows:

One pound of anthracite fuel, in each of four experiments, gave the results 4·30, 85·0, 7·86, and 6·76 lbs. of water evaporated, being an average of 6·85.; while one pound of bituminous artificial fuel, in each of four experiments, evaporated 9·35, 11·11, 12·88, and 10·61 lbs., averaging 10·99. The anthracite average is 7·40 lbs. of water. The average of bituminous is 14·88 lbs. of water.

The non-uniformity of result is partly due to the imperfect manipulation in mixing the coal and the clay, and partly to the varying amounts of solution of rosin absorbed in the bath to which the material is subjected; the imperfect manipulation can be remedied by the adoption of proper machinery for that part of the process.

The ability of the artificial fuel to bear transportation is less than that of anthracite or good lump bituminous coals, but the structure is firmer than that of many bituminous and semi-bituminous coals that are carried to market. The masses will generally break up with a fall of 3 feet upon a stone pavement, but are strong enough to bear ordinary handling and transportation; and should they become broken, will suffer no damage, unless exposed to wet.

The samples of artificial fuel examined are well adapted for use for purposes in which great intensity of combustion is not desired.

For the production of steam in stationary boilers, and for household purposes, it can be employed equally as well as any ordinary coal; and, whenever the cost of preparation is less than the cost of mining coal, this invention will make available the immense amounts of small coal now allowed to remain useless at the coal mines. It appears to work far better than the balls or bricks of coal dust and clay and lime that came into vogue in this city many years ago, when anthracite was brought to market without preparation by the coal breaker, which had not then been invented; the balls or bricks thus made not having the protection from wet secured by Mr. Loiseau, by his resinous coating.

We consider the method of preparing artificial fuel from waste anthracite and bituminous coals, as presented by Mr. E. F. Loiseau, as ingenious and well adapted to the purpose, and worthy of the attention of those interested in the production of a cheap fuel, adapted to a great variety of uses.

Respectfully submitted.

Charles M. Cresson, } Sub-
William H. Wahl, } Commit-
John Wise. } tee.

By order of the Committee,
D. Shephard Holman,
Actuary.

[The samples of artificial fuel, presented to the Franklin Institute to experiment upon, were simply pressed by hand and could not be made as solid as they will be when pressed by appropriate machinery.

The percentage of ash is larger than in ordinary coal, as the clay is not consumed; but the other advantages of the artificial fuel, in point of durability, cleanliness, and cheapness, more than compensate this small disadvantage.

The cost of manufacture at the mines, including the coal and all the materials, will, it is stated, not exceed one dollar per tun.—EDS.]

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NEW BOOKS AND PUBLICATIONS.

SCIENCE RECORD FOR 1872. Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50: extra binding, half calf, $2. Munn & Co., Publishers, 37 Park Row, New York, Office of the SCIENTIFIC AMERICAN.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The leading discoveries, facts, and improvements, in chemistry, mechanics, engineering, natural history, and the various arts and sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis tunnel, the Hell Gate works, the Brooklyn suspension bridge, the Hoosac tunnel, the St. Louis bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library.

APPLICATIONS FOR EXTENSION OF PATENTS.

SAWING MACHINE.—Harriet L. Low, Galena, Ill., administratrix of Henry H. Low, deceased, has petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

TURNING AND SLIDING TABLE FOR RAILROAD.—William Sellers, Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

COMBINATION OF LEAD PENCIL AND ERASER.—Hymen L. Lipman, Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

MODE OF PROTECTING GILDING ON GLASS.—Peter V. Mathews, Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, April 10, 1872.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines. One Dollar and a Half per Line will be charged.