

Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

"The American News Company," Agents, 121 Nassau street, New York.
"The New York News Company," 8 Spruce street.
Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st.,
Tribner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill,
London, are the Agents to receive European subscriptions. Orders sent to
them will be promptly attended to.
A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the Ger-
man States.

VOL. XXII., No. 20 . . [NEW SERIES.] . . Twenty-fifth Year

NEW YORK, SATURDAY, MAY 14, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

*Improved Portable Engines for Agricultural Use.....	311	of the Swallow.....	317
Meteors.....	312	*Improved Cherry Stoner.....	318
A Chapter on Chinese Walls.....	313	*Improved Screw Driver.....	318
Apparatus for Kings.....	313	Who first Named the Pacific Ocean?.....	318
*Improvement in Welding Plates.....	314	Cellars.....	318
American Marbles.....	314	Bosquillon on the Secrets on Longevity.....	318
Changes in Fishes.....	314	The American Museum of Natural History.....	319
*McNiel's Improved Tobacco Pipe.....	314	The Dangers of Drugs.....	319
The First Japanese Railroad.....	314	Steam Boiler Inspection.....	319
The Planet Mars.....	315	Hartford Steam Boiler Inspection and Insurance Co.....	321
Pat Lacquer for tin plates.....	315	Mechanical Recreations.....	319
*Obituary—Zerah Colburn, Engineer, and Leading Writer of Engineering papers.....	315	Curious Association among Animals.....	320
*A Simple Question.....	315	Chemistry of Zirconium.....	320
Scrapping Slide Valves.....	315	Scientific Intelligence.....	320
Steam on Common Roads.....	316	Hartford Steam Boiler Inspection and Insurance Co.....	321
Collisions on Railways.....	316	Earthquake in Guayaquil.....	321
Buzzing up.....	316	Some Hints about Screws.....	321
About Making Tea.....	316	Safety House Lamp.....	321
The First Artificial Fire.....	316	Iceland Spas.....	321
English Steam Flows in Louisiana.....	316	Steam Omnibuses.....	321
Preservation of Stones.....	316	Patent Decision.....	321
Thames Mud Butter.....	316	Applications for the Extension of Patents.....	321
The Oxygen Light.....	317	Recent American and Foreign Patents.....	321
Medical Properties of Eggs.....	317	Answers to Correspondents.....	323
To Clean Marble.....	317	List of Patents.....	323
The Osmogenic Process.....	317	Inventions Patented in England by Americans.....	323
Dr. C. A. Lee on Elements of Organic Life.....	317		
Modification in the Construction of the Steam Engine.....	317		

To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE AMERICAN MUSEUM OF NATURAL HISTORY.

The want of a public museum of natural history and of a zoological garden in the city of New York, has long been felt, and has been frequently discussed in our papers, but all of the efforts at remedying the defect, that have hitherto been tried, have failed for want of means. It is therefore with pleasure that we observe a new movement on the part of some of our enlightened and wealthy citizens to establish a museum in the Central Park, that shall recall many of the best features of similar European institutions, and be secured from political interference, by remaining the property of a private corporation.

The first annual report of "The American Museum of Natural History" has just been published, from which we gather some interesting facts.

It appears that in December, 1868, a number of gentlemen addressed a letter to the Commissioners of the Central Park, expressing their desire that a great museum of natural history should be established in the Park, and inquiring if the Commissioners were disposed to provide for its reception and development. A favorable answer having been received, steps were taken to obtain an act of incorporation, and to solicit subscriptions.

In a few weeks the sum of \$44,550 was secured, and the purchase of collections at once begun. A valuable suite of North American birds, containing over three thousand specimens, was procured of Mr. D. G. Elliot, and Mr. Bell, a distinguished taxidermist, was employed to mount them. The committee to whom the matter was referred, having heard that the collection of the late Prince Maximilian of Neuwied were for sale, at once requested Mr. Blodget and Mr. Elliot, who were traveling in Europe, to take measures to secure them. The price paid for the collection was £1,500 sterling, and it is now on its way to America. The collection consists of 4,000 mounted birds, 600 mounted mammals, and about 2,000 fishes and reptiles mounted and in alcohol.

The presence of Mr. Elliot in Europe has been of great importance to the Board of Trustees, as he is familiar with several departments of natural history, and can aid in making proper collections of objects to be purchased. He found a dealer in birds and animals in Paris, who had accumulated a vast collection of curiosities, and of him he secured specimens to supplement the collection of the Prince of Wied. This was much better than to purchase the whole collection, for which the price of \$45,000, gold, was asked. Of M. Verreaux, Mr. Blodget and Mr. Elliot secured 2,800 mounted birds, 220 mounted mammals, 400 mounted skeletons of mammals, birds, reptiles, and fishes, at a cost of \$16,000 in gold, and of M. Vedray 250 specimens of mounted mammals and Siberian birds have been purchased. In addition to the above, many valuable objects have been presented to the Society by Baron Osten-Sacken, Mr. Robinson, and others, and they have now a collection that when properly exposed, will be a great source of instruction and amusement to our citizens.

The temporary place of deposit assigned by the Commissioners of the Central Park for the collection is the upper

story of the Arsenal. The whole of this floor has been fitted up with cases, at the expense of the Commissioners, and the work of unpacking and arranging can now be rapidly carried on.

The trustees of the American Museum employ their own curators and pay them their salaries, but the police force and servants will be furnished by the Park authorities. The trustees of the Museum have the right to exhibit the collections in their own name, and we suppose for an entrance fee, three days of the week; all the rest of the time they will be open to the public free of charge.

Perhaps the most important clause in the agreement made between the Trustees and the Commissioners, is the one relating to the ownership of the collections. The Trustees have the right to remove their property upon giving six months' notice, and the Commissioners can require them to move the collections upon the same terms. In the event of the control of the Park passing into the hands of politicians, as it may easily do by act of Legislature, and of an attempt to make the Museum a source of speculation, the Trustees can withdraw their collections, and save them from falling a prey to these unprincipled men. The chief anxiety of thoughtful citizens has been to keep the educational facilities of the Park out of the hands of the city authorities, and it has been proposed to put the Zoological garden under the control of a private corporation for this purpose.

The recent unceremonious way in which the former Commissioners of the Central Park were legislated out of office is a fair illustration of what may be expected in the future. It is a pity that the Zoological Society was permitted to become extinct, as it could have occupied the grounds set apart for the garden, on the same terms as the Trustees of the Museum of Natural History now hold possession of the Arsenal, and in case of a change in the rules of the Park, the collection of live animals could have been saved from being sold or used as a source of profit to unplaced office seekers. As it is now, there is no guarantee that the Zoological garden may not be looked upon as a tempting field for a class of biped animals who have a keen scent for rich pastures where the work is light and the pay heavy.

The Trustees of the American Museum of Natural History close their report with an appeal to the public for further assistance; they say that the present subscription list of \$52,000 should be increased to at least \$100,000, and in this appeal they ought to have the sympathy and practical aid of our citizens. We also notice in this connection that the Legislature of the State of New York have changed the name of the State cabinet at Albany, and have put it under the direction of Professor James Hall. The Albany geological specimens are typical ones, and are of the utmost importance to the scientific men of the whole country, as they afford the key to the geological nomenclature of the United States. There is, therefore, great wisdom in carefully preserving them and intrusting them to the geologist who has given names to the groups of rocks in the State, and has done more than any other to illustrate and explain the relative position of American formations. The Legislature also authorized the presentation of duplicates to the American Museum of Natural History in New York.

THE DANGERS OF DRUGS.

The public mind has been much exercised of late by recitals of fatal mistakes of those whose business it is to deal out drugs and medicines; and our countrymen have been rather taught to believe that these mistakes were in a great degree attributable to the looseness of our laws and our want of system in this important regard; and that in other countries where a better system prevailed such mistakes rarely or never occur. There is some truth in this prevailing idea, and much might undoubtedly be done and should be done to prevent the recurrence of such accidents.

Indeed the public can hardly be aware of the disgraceful, and, in view of the possible consequences, alarming ignorance of many of those engaged in the retail drug business. We frequently receive letters (from the country of course), asking information relative to some of the most common substances, which the writers had been unable to obtain at their village drug store, simply because the articles had been inquired for by the technical or chemical name of the substance required. We this week received such a letter asking information as to chloride of sodium—common salt—and as to the bi-sulphide of carbon—the latter of course not so common as the former, but still a chemical with which every druggist should be familiar.

It is to be wondered at that when men, so deplorably ignorant of the very rudiments of knowledge necessary to their business, are intrusted with the dealing out of medicines, many of which, as everybody knows, are active poisons, fatal mistakes are frequent? In fact is it not rather a wonder that we are not more frequently called upon to chronicle such sad results?

That such mistakes, however, are possible in other countries than ours, is evidenced by the following case, reported in the *Chemist and Druggist*:

"An inquest was held at Pemberton, near Wigan, on the body of William Richardson, collier, aged 26, who had died on the previous Sunday immediately after taking a powder which he had obtained at the surgery of Messrs. Johnstone and Beaman, surgeons, Upholland. Mr. Peace, solicitor, appeared on behalf of Mr. Johnstone, who had dispensed the medicines, and stated that by an unfortunate mistake strychnia had been administered to the deceased instead of santonine. Mr. Johnstone had only recently entered upon the practice, and was not aware that any strychnia in a crystal state was in the surgery. The bottle was not labeled, and was in a cupboard in which the santonine was kept.—Mr.

George Warwick Johnstone, the surgeon who dispensed the medicine, gave evidence. He said he was not at the time aware that there was any strychnia in a crystal form in the surgery. The bottle was not labeled poison, and in several respects it resembled the one in which santonine was kept.—The verdict of the jury was to the effect that death had resulted from censurable oversight on the part of Mr. Johnstone, and that, in the opinion of the jury, great blame was attached to those who placed the bottle in the closet without a proper poison label."

Here we have an instance of gross carelessness, but in this country we fear carelessness and ignorance are often combined. There ought to be legal enactments that shall secure either carelessness or ignorance from tampering with human life.

Educated and competent chemists are now forced to compete with those who have not the first qualification for dispensing drugs. It was only last week that we sent a very plainly written prescription of an eminent practitioner of this city, copied under his supervision in plain, unmistakable handwriting, to a dyspeptic friend in the country. The prescription was returned with the message that the local druggist (sic) could not make it out; yet every drug was official, and to each the correct name, as found in the U. S. Dispensatory, was given.

The competent druggists of this country owe it to themselves, as well as to a too credulous public, that this evil shall be corrected. They should ask and press for the enactment of such a law as will forever exclude ignoramuses from their responsible profession.

STEAM BOILER INSPECTION.

In our issue of April 23d, we published an article upon Steam Boiler Inspection, which has called forth a communication from the steam boiler insurance company therein referred to. This company proves to be the Hartford Steam Boiler Inspection and Insurance Company, whose advertisement has often appeared in our columns.

This letter puts a somewhat different face upon the matter, and corrects a misapprehension derived from the statements of a Chicago paper upon which we based our remarks.

It seems that the company referred to had commenced business in Chicago before the inspection law was passed, and it was simply asked by the boiler owners who had insured and were under guaranteed inspection by the officials of the company, that they should be exempt from the inspection of the city officials. In other words, it is desired by the parties interested that the inspection of the company shall be accepted in lieu of the other, for all such boilers as are under regular inspection by the company. It was not asked that such boilers as are not under the supervision of the company should be inspected by them.

In this point of view we certainly see no injustice in exempting insured and regularly inspected boilers from other inspection. There is certainly the strongest guarantee that such inspection would be faithfully performed, namely, a pecuniary risk attending upon neglect.

We are informed that the company make their inspections quarterly, the inspection being done by salaried experts, whose positions depend upon the faithfulness with which their duties are performed.

Provision was made that if from any reason, for any boiler thus left in charge of the company and exempted from inspection by the city officials, the company should decline to continue a risk, or if the insured should decline to make necessary repairs, the company should at once report the same to the City Inspector so that no boiler might go uninspected.

We are told that although the post of City Inspector has been in several instances proffered to the company, it has been uniformly declined as conflicting with true business policy; and that the company neither ask nor desire any special legislation in their favor.

The plan proposed in Chicago was suggested by the steam users themselves, and in the light of our present information we see nothing objectionable in it.

The company further avow their belief in thorough inspection laws, and indorse our views as expressed in the article alluded to above, in regard to the payment of liberal salaries to competent men, and minute examination for defects.

We are, however, informed that in the experience of the company it has been found that the responsibility of city and State officials rests very lightly upon them, and that where there is no competing element their work is generally very much neglected, a statement which the great number of explosions constantly occurring seem to confirm.

As we said in our former article we believe the system of boiler insurance a good one, and regard it with hearty favor; and we are glad that we can thus, on official authority, make a disavowal of what we felt sure was calculated to greatly injure its usefulness.

MECHANICAL RECREATIONS.

The purpose of this article is to show that mechanical employments furnish the most healthful and delightful recreations for such as are not constantly employed in them.

The purpose of recreation is as the term implies to re-create or renew the exhausted energies of mind and body. Perfect rest, such as is secured by good, sound, refreshing sleep, is of all the means by which this is accomplished, the most powerful.

It is true food is the fuel by which the human engine runs and does work, but the analogy between a machine constructed of lifeless material and the animal economy ceases when we consider anything beyond the mechanical power of muscular movement derived from the consumption of food.

The human machine includes within itself a directing

power which wearies and wears, and cannot be continuously employed in a single direction without fatigue. The wise Solomon saw that much study is a weariness to the flesh. And modern physiologists have not failed to see that undue manual labor impoverishes and enfeebles the mind.

The will concentrated long upon compelling the muscles to perform a certain routine of movement, finds itself at length powerless to command. It must then cease exertion entirely as in sleep, or it must exert itself in some new direction. This is what is commonly called recreation, that is, an occupation which affords an agreeable contrast to that which has caused fatigue.

We think it is indisputable that any employment which exacts moderate muscular activity, at the same time interesting the mind by employing its powers upon such topics as do not arouse the animal passions, while they moderately engage the higher mental powers, has in it all the elements of healthy recreation. In our opinion nothing whatever so combines these elements and furnishes so cheaply the needed relief to professional men and hard students as some mechanical occupation, in which originality of design may be united with manual skill in execution.

In such recreation the entire tendency is to gratefully relieve the mind, gently exercise and invigorate the body, and build out and cultivate powers which cannot be developed to the moral hurt of the individual, but greatly increase his intellectual stature.

In such occupations the mind wearied with business cares, or by much study, may revel in refreshing beauties of form, color, and motion, and find the highest of all pleasures in the contemplation of the relation of simple causes to complex effects.

A man who has in this way attained to even moderate skill, may find his lathe a magical instrument by which he can clothe the rudest materials with forms of beauty, and gratify to the utmost that wonderful combination of faculties by which man most asserts his superiority over the brutes.

Imagination here finds, if not so wide a scope as in poetry, or the fine arts, sufficient to give it ample employ, and to banish from the mind all evil thinking and day dreaming, which to the young mind is always hurtful and sometimes fatal.

On this latter account we recommend most earnestly mechanical recreation for the young. Let the boys build windmills and miniature dams. They soil their clothes, but how much better soiled garments than soiled minds. They may cut their fingers with the tools you permit them to employ, but you will find such wounds heal in less time than the foul ulcers of moral corruption.

Every man who can afford it should supply his boys with tools, and a room where they may be used and cared for. A boy takes to tools as naturally as to green apples, or surreptitious and forbidden amusements; and ten to one if he has a chance to develop his mechanical tastes and gratify them to their full extent, his tendencies to vicious courses will remain undeveloped. Such a result is enough to compensate for all the expense and trouble the indulgence we recommend would entail; while the chances that the early development of his constructive faculties may in this mechanical age be the means by which he may ultimately climb to fame and fortune are not small.

CURIOUS ASSOCIATIONS AMONG ANIMALS.

In the palmy days of Barnum's Museum, one of its chief attractions was what was called "The Happy Family," composed of a large number of abjectly miserable animals, generally supposed to have a natural antipathy for each other's society, living together on compulsion, and whose manifestations of stupid tolerance were accepted by the country visitors to that great institution, as indisputable evidence of their blissful state of mind, and the regenerate condition of their hearts.

Once, while on a visit to the collection alluded to, we remarked a good clergyman, evidently hailing from some remote rural location, highly delighted in the contemplation of "The Happy Family," who remarked, somewhat in the style of the venerable Chadband, "Herein we see a type of the fulfillment of the blessed prophecy, that the 'Lion shall lie down with the lamb.'"

Just at the moment, one of the keepers chanced to pass. At the sight of his familiar face, the wretched little dog—whose confinement had not obliterated fond memories of past days, when he might roam and frisk at will, and choose his own society—rushed frantically to the bars of the cage with doleful cries and piteous pleadings, thrusting out his helpless little paws in vain appeal to be released. It was quite affecting to witness the expression of stolid despair in his little brute countenance, when he found no notice was taken of his petition, and the desperate way in which he walked to a partially secluded corner and threw himself prone, as though all hope had fled. The little episode was not without its effect upon the bystanders; and the clergyman referred to, evinced his goodness of heart by loudly denouncing the affair as a cruel exhibition, in which verdict we heartily concurred.

If the reader will follow us for a little while, we will introduce him to some more curious associations than Barnum's Museum ever displayed; associations originating in the common interest of the parties to them, or in the desire to relieve the oppressive sense of solitude which even the lower animals seem to feel.

The well-known associations of parasites with the animals upon whom they prey, are the most unpleasant and disgusting, as they are the most familiar examples of animal companionships. These are only in the interest of one of the parties, and are generally strongly objected to by those who thus find disagreeable company thrust upon them.

We shall find a more pleasant, if not a more instructive field of contemplation in those voluntary associations and attachments which animals of different species form with and for each other.

Foremost among these is the companionship of domestic animals with man. Familiar as household words are the innumerable stories of faithful attachments mutually existing between man and the dumb creatures, which so largely contribute to his sustenance, protection, and pleasure.

Scarcely less familiar are the stories of apparently incongruous attachments between dogs and cats, cats and mice, fowls of different species, etc. Riding once along one of the pleasant drives radiating from Saratoga Springs, we saw the comical spectacle of a pig sweetly sleeping, literally in the arms of a fond calf. These two creatures, cut off from all society by the external limits of a lonely farmyard had become all in all to each other, and shared their "bit and sup," and their quiet couch in the sunny corner, with mutual satisfaction. Very many similar instances of unusual attachments between domestic animals might be enumerated, but we wish, more particularly, to call attention to such associations as are made, apparently through the instinctive consciousness that a common benefit may accrue from a union of diverse gifts and powers.

For this purpose we find a rich collation of facts, ready to hand, in a paper not long since read before the Belgian Academy, by P. J. Von Beneden, on "Animals as Fellow Boarders." We are told, that the *Donzella*, a graceful little fish, found in different seas, takes up its abode in the stomachs of the sea cucumbers, and that these lodgings are shared by prawns and pea crabs, dining together on the abundant stock of food which the sea cucumbers—being excellent fishers—provide.

In the Indian seas, a modest little fish with an extensive scientific appellation, lodges habitually under a star fish, and feeds on the crumbs which fall from the table of his patron. A Siluroid, of Brazil, of the genus *Platystoma*, lodges a species of very small fish in its mouth and shares its daily food with its *protège*.

Other instances of mouth lodgers might be mentioned; even Crustacea taking advantage, in this way, of the superior predatory ability of more active creatures. In the China seas Dr. Collingwood found an anemone, in whose interior little fish resided, whose name he did not know, but which seemed content and happy in their curious abode. The pea crab lives in mussel shells, and picks up a comfortable living without in the least injuring its hospitable entertainers. The ancients, we are told, thought that the mollusks, having no eyes, were glad to avail themselves of these little crabs, but the probabilities are, that the crabs eyes are employed solely for their own benefit. Like other crustaceans, of the same rank, says Von Beneden, "these little creatures carry on each side of the shell, at the end of a movable stalk or support, a charming little globe, furnished with hundreds of eyes, which they can direct, as an astronomer turns his telescope, to any part of the firmament. What cannot be doubted is, that the little intruders live on perfectly good terms with the mussels and if the latter supply a convenient and safe lodging, they, on their side, profit largely by the morsels which fall from the claws of their guests, who are well placed and well provided with prey-catching apparatus. Snugly seated in their living house at the bottom of the sea, they possess a movable lair which the mussel carries about, and they can choose the best moment for attack, and fall upon the enemy unawares."

But the most remarkable instance of association for mental profit, is that of the hermit crab. These creatures are decapod crustaceans, somewhat resembling miniature lobsters, who make their abode in deserted shells, and change both their skin and their dwelling as they increase in size. The young ones are contented with very small habitations. The shells they inhabit are derelicts they find at the bottom of the sea, and in which they conceal their weakness and personal disadvantages with obstinate persistence.

These singular creatures have too soft an abdomen to confront the dangers they encounter in their incessant wars, and the shells in which they thrust themselves supply at once lodgings and shields. Armed thus from head to foot the soldier crab marches proudly against his enemies, and fears no danger, because he has a secure retreat. But this soldier, or hermit crab, is not alone in his dwelling. He is not an anchorite like those dwelling in air, for by his side a worm is commonly installed as fellow-boarder with him, forming one of the most remarkable associations which is known. The companion worm is elongated like all the Nereids, and its supple, undulating body is armed along its sides with bundles of lances, pikes, and daggers, the wounds from which are very dangerous. The crab, ensconced in his borrowed armor, and flanked by his terrible acolyte, attacks all he finds before him, and knows no reverse. Thus, around his domain, we observe a prosperity not seen elsewhere, and on his shell there usually flourishes a whole colony of Hydractinia, blooming like a flower-bed, and inside we often find Peltogaster, Lyriope, and other Crustaceans, who convert it into a true pandemonium.

Besides many other associations formed with various species of soldier crabs, there are barnacles, which lodge on the skin of the whale, in company with whale lice and other marine creatures, worms which live as companions in the same sheath with their congeners, and even with included mollusks; creatures which live in freedom in their youth, but, when they approach to maturity, throw away their legs and eyes, change their clothes, and attach themselves permanently to some animal upon which they are ever after wholly dependent.

The Remora, an animal found in the waters of the Mediterranean, attaches itself with vigor to other animals by means

of an apparatus attached to its head, and the inhabitants of Mozambique make use of this habit to entrap fish and other marine animals. They catch Remoras, put rings in their tails, attach lines to the rings, and cast the Remoras forth into the sea. Presently the Remora will have stuck to something and is drawn in by the tail, holding fast to the creature it has unintentionally brought to grief.

But we cannot dwell longer upon these curious associations. Our readers will agree with us, that they afford food for much profitable reflection, and that they may instruct as well as amuse. They teach how ample is the provision made for the sustenance and protection of the myriad creatures which people our globe, and lead to the belief that these wondrous provisions cannot be alone confined to this little mustard seed of a planet, among the magnificent heavenly bodies that circle together around the great life-giving, life-sustaining sun.

CHEMISTRY OF ZIRCONIUM.

Dr. Ernest Melliss has published "Contributions to the Chemistry of Zirconium" that contain much new matter; and as this element is now employed in the zirconium light, it may be of interest to know something more about it than we can learn from any books on chemistry.

There are scarcely more than a dozen minerals that contain zirconium, the most important of which is the zircon, which is so called because it was used as a false jewel, and received the name jargon, or zircon, from dealers in precious stones. There are fine specimens of this mineral in North Carolina, New York, New Jersey, and Pennsylvania.

The pure zircon contains 66.96 per cent oxide of zirconium and 33.04 per cent silica; its specific gravity is 4.05 to 4.75. From this mineral the metal zirconium and all of its compounds are prepared. It is heated to redness and quenched in water so as to be easily pulverized, and the fine powder is mixed with four times its weight of carbonate of soda, and fused in a platinum crucible. The mass from the crucible is treated with hydrochloric acid, evaporated to dryness to separate the silica, again dissolved, and the oxide of zirconium precipitated by ammonia.

By mixing the powdered zircon with carbon, and passing chlorine gas over it, the chloride of zirconium can be formed along with the chloride of silicon, which latter being very volatile, can be expelled by heat, leaving behind the zirconium salt nearly pure.

The resolution of the mineral by fluoride of potassium has also been recommended, but the best method appears to be to fuse it with bisulphate of potash, and thus on subsequent treatment with sulphuric acid to convert it into pure basic sulphate of zirconia.

The reducing agent employed in the preparation of metallic zirconium is aluminum, and the operation is interesting as being applicable to other metallurgical processes. The double fluoride of zirconium and potassium is first prepared by dissolving the oxide in hydrofluoric acid and pouring the liquid into a concentrated solution of neutral fluoride of potassium. The precipitate thus formed is well dried and intimately mixed with twice its weight of finely-divided aluminum, and exposed in a gas carbon crucible to a heat sufficient to melt copper.

The zirconium will be found in the form of leaves and scales penetrating the aluminum, which remain after dissolving out the aluminum by hydrochloric acid. The metal is hard, and crystalline, like antimony, with the specific gravity of 4.15. It is said to exist in three states the same as silicon and boron, namely, amorphous, graphitoid, and crystalline, and is less fusible than silicon, and burns only at the temperature of the oxyhydrogen blow pipe.

No uses have thus far been suggested for zirconium, and, in fact, it has been too little studied to enable us to speak with certainty about it. In consequence of some of its chemical relations it is now classed with tin, titanium, thorium, columbium, and tantalum; while by other writers it is put in the same group with carbon, boron, and silicon, instead of with aluminum as formerly.

The oxide of zirconium is now employed to point the pencils used in the oxyhydrogen light. It is said not to waste away as magnesia and lime do; but the cost of the oxide and the trouble to prepare it must stand in the way of its general adoption.

Dr. Sorby about a year since published an account of the discovery of a new metal associated with zirconium, which he called "jargonium," but recently he announced his mistake. The reactions attributed by him in the first instance to jargonium he now finds are, in fact, owing to the presence of a small quantity of the oxide of uranium in the mineral zircon, and the supposed new metal must therefore be erased from our list. The compounds of zirconium have thus far no interest in the arts.

SCIENTIFIC INTELLIGENCE.

HEATING WITH GAS.

MM. Jacquet and Hauteur, in Paris, have invented a method for heating with gas by reflection, which seems to offer some advantages over previous attempts in this direction. The gas burns with inverted flame, and a double hearth below the burner to absorb all of the products of combustion. The hearth, which is not in sight, throws off all of its heat and light by reflection from a series of mirrors made of red copper, and the effect is said to be remarkable. It is difficult without diagrams to convey a perfect idea of the invention, which is said to be applicable to all kinds of cooking and heating purposes.

TEST FOR SMALL QUANTITIES OF ALCOHOL.

A few drops of the liquid to be tested are poured into a