would be certain death, and probably a painless one. In one instance a workman who had been rendered insensible by the gas, on his recovery had his combativeness so much aroused that he attacked the bystanders, and was with difficulty kept in bounds. The action of the gas upon the eyes is to inflame them; they become red and swollen, and finally closed, with severe pain. As a remedy, a wash composed of one third of a grain of corrosive sublimate in three ounces of water, was applied.

A mixture of air and sulphureted hydrogen is remarkably explosive. A wire heated red hot and allowed to cool until its color is dark, is sufficiently hot to occasion the explosion of the mixture. The presence of a small quantity of water vapor will prevent the ignition of the gases. Great care should be observed in factories where sulphureted hydrogen is likely to be produced, as its action is subtile, and liable to occasion unexpected explosions as well as loss of life from its poisonous effects upon the system.

PREPARATION OF OXYGEN GAS.

Robbins' method for the preparation of oxygen gas without the aid of heat, has been modified by Böttger, and is represented as affording a pure gas as readily as hydrogen can be made from zinc and dilute sulphuric acid. He takes equal weights of peroxide of lead and binoxide of barium, in a tubulated retort or flask, provided with a safety tube, and pours on weak nitric acid (9° B.); the evolution of oxygen takes place regularly, and the reaction is explained as follows: Binoxide of hydrogen is first formed, and this is at once decomposed by the peroxide of lead, and pure oxygen is liberated. The mixture of the dry lead and barium salt will keep in a well stoppered bottle, and thus the necessary reagents for the evolution of oxygen can be always on hand.

DU MOTAY'S METHOD OF PRODUCING HYDROGEN.

Dr. C. Widemann gives in the *Journal of Applied Chemistry* the latest and most economical method for the manufacture of hydrogen gas on a large scale, invented by Tessie du Motay, and explains why the old way of decomposing steam by live coals cannot succeed. The reason why water cannot be burned as a fuel with any economy is stated as follows: "First, because in the generation of steam a great quantity of latent heat is absorbed; second, because the vapor produced at temperature of 100° C., requires a considerable quantity of free heat, in order to raise it to the temperature at which it will be decomposed, and this heat must either be taken from a special apparatus for super-heating, or it must be furnished by the incandescent coal which it ought to decompose; third, because the retorts containing the carbon which decomposes the water, when brought to a red heat, and exposed directly to the steam, soon become damaged and unfit for use."

He might have added that in most cases the iron of the fire box or grates, or the nozzel of the blower is what is burned up in the production of hydrogen in this way.

Du Motay overcomes all of these difficulties in a very ingenious manner. He discovered that the hydrates of soda, potash, strontia, baryta, or lime, when mixed with charcoal, coke, anthracite, pit coal, peat, etc., and heated to redness, are decomposed into carbonic acid and hydrogen, "without further loss of heat than that due to the production of the carbonic acid and hydrogen."

The hydrates can be used indefinitely, provided they be moistened and regenerated after each operation. No special apparatus for the generation of steam is necessary, and the retorts are less liable to attack. The operation is analogous to the manufacture of carbureted hydrogen by the distillation of coal.

The invention is scarcely inferior in importance to the discovery by the same chemist of a cheap method for the manufacture of oxygen, and if the two processes can be combined, we are in a fair way of obtaining oxyhydrogen gases for metallurgical and other purposes.

With such a source of heat as this constantly at hand, the manner of reducing all metals from their ores will be revolutionized, and many metals which are now with difficulty worked, will at once become available.

IODINE FROM CHILI SALTPETER.

Professor Wagner, in his reports, says that the manufacture of iodine from Chili saltpeter already amounts to 30,000 lbs. per annum. The method invented by Thiercelin for its reclamation from the crude material is as follows: The mother liquors resulting from the manufacture of saltpeter are treated with a mixture of sulphurous acid and sulphite of soda, in proper proportion, and the iodine will be precipitated as a black powder. The precipitated iodine is put into earthen jars on the bottom of which are layers of quartz sand, fine at the top, and coarse at the bottom; from this it is removed by earthen spoons into boxes lined with gypsum, and a greater part of the water thus removed. It is sometimes sold in this impure state, or further purified by sublimation.

The Great Fire in the Woods near Ottawa.

As we are preparing for the press we receive news that the great fire in the woods near Ottawa, Canada, has completely surrounded and now seriously menaces the city. Much property has been destroyed, and quite a number of lives have been lost. North of the city, one and one half miles from the suburbs of Hull, containing all the saw mills and a vast quantity of sawed lumber, the flames are distinctly visible. If the fire reaches the lumber at Hull nothing, it is thought, can save Ottawa from destruction.

MECHANICAL MOVEMENTS.—We are in receipt of a large number of solutions to mechanical problems, published on page 71, present volume. These will all receive due attention at our earliest convenience.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

This learned body commenced its annual session at Troy, N. Y., on the 17th of August.

The Vice President took the chair, and in response to the address of welcome delivered by the Hon. John A. Griswold, thanked that gentleman for his generous recognition of the association, and took the opportunity to review briefly the work of the society, tracing its first incipient beginning in 1840, when it took being in the study of geology and natural history. In 1848 it was reorganized on a broader basis, and the mathematical sciences were comprehended in its investigations. During the four years of the rebellion no sessions were held, but in 1866 it was reorganized at Buffalo, and has achieved most important results since that time. The association to-day misses some of its most honored members. Silliman, Hare, the Rogers, Bache, Hitchcock, and Emmons are no more. Sickness holds others in bonds. Prof. Agassiz, though well enough to take the mountain air, is not yet strong enough to be with us, and Prof. Dana is too feeble to come. Prof. Henry is in Europe, and thus we lose some of our strong men. But we have strength left. There are young men here who are an honor to the cause. It must be clearly understood that this association is not a close body, designed only for the select few; it is more democratic: it enrolls all who take an interest in science, and assures all a candid hearing, no matter what his creed or country. This is the fourth time we have met in this great State, and it is proper that this Empire State should be considered by the representation of American science. It was the first State in the Union to organize a complete system of geological and natural history surveys of its territory, and is therefore classic ground for the student of those sciences. To Troy we look with interest for the success of our meeting, on account of the Rensselaer Polytechnic School—the pioneer of the kind in America—and which, having seen half a century of prosperity, is now more active than ever. To the chemist end metallurgist the extensive iron works here offer great fields for special study, such as few others in the world can equal. Here applications of science render the conversion of ore an ascertained art, and no longer a venture of empiricism. Here also are those famous Bessemer steel works, of whose wonders we have all read, and whose importance is not limited to the production of steel, but, studied by the aid of the spectroscope, throws new light on the chemical and physical constitution of the sun and the furthest nebulæ. These things are mentioned to show that the practical is dealt with by this association.

The work of organization was then resumed, and the following committee appointed: Prof. John Tarry, Prof. E. D. Cope, A. Gray, E. N. Horsford, Prof. Hillyard, and Prof. Winchell. These are on special business before the convention, and all gentlemen of great scholarship, more than half of them presiding over most important colleges.

The Convention then divided into sections, as follows: A, Mathematics and Physical Sciences; and B, Geology and Natural History; each meeting at different places for discussion and business. Section B completed its organization before adjournment, by electing as chairman Prof. Asa Gray; Secretary, Prof. Hartshorn; Sectional Committee, Profs. Hall, Morris, and Hyatt; Committee to unite with Common Nominations, Profs. Dale, Moses, Dalrymple, and White.

Among the papers read on the 18th, and up to the time of our going to press, the only ones of much popular interest, are one on the Isothermals of the Lake Region, by Prof. Winchell, and Notes on the Condors and Humming Birds of the Equatorial Andes, by Prof. Orton.

The paper read by Prof. Winchell provoked earnest debate. The paper embodied the results of careful and prolonged observation at various localities in the region west of the great lakes as far as Nebraska. The Professor used in the illustration of the subject nine isothermal charts for several of the summer months, and winter, autumn ,and spring year mean minima and extreme minima. The professor indicated the wonderful changes in temperature caused by the great lakes in the contiguous country. The cooling influence, science attests, is exerted chiefly on the west side of Lake Michigan and the warm on the east, which depends again on the prevailing winds in summer along the shores of the lake from the east of the meridian in summer, and west of it in winter. In July, for example, the cooling influence on Lake Michigan deflects the isothermal 140 miles, while to the west of the lake they are deflected 400 miles. In January, the mean temperature on the east side of the lake is from four to six degrees higher than on the west side. The isothermals for spring show a marked cooling influence exerted on the west side, and those for the autumn a warming influence on the east side, the joint effect of which is to render the growing season six to thirteen days longer on the east side than on the west side of the lake. The most marked effect and the most surprising is felt in times of *extreme* weather, especially if cold. The isotherm of mean and extreme minima run almost literally north and south along the shore of Lake Michigan. The most excessive cold at Mackinac for a period of 28 years is not on the average greater than at Fort Riley, in Kansas, 480 miles further south. At Chicago it was one degree less than for eleven years. The isothermals for the year might be expected to show no resultant of lake influences. On the contrary, it demonstrates wonderfully the wavering influences excited on the east side; this because the liquid temperature is above that of the contiguous land. Several causes account for the increased heat of the water. The great depth of the lake (900 feet) is sufficient to secure 18 degrees of increased temperature from the earth's heated interior. This, diffused through the waters of the lake, would result in an equal and average elevation of temperature sufficient to cause the phenomena witnessed in the temperature.

In his paper, entitled "Notes on the Condors and Humming Birds of the Equatorial Andes," by Prof. James Orton, of Vassar College, said no bird has suffered more from the hands of the curious and scientific than the condor. Exaggerated stories of its size and strength continue to be published in our text-books, as, for example, that it carries off children, and that the expanse of its wings is from 15 to 20 feet, whereas it is not capable of lifting from the ground over a dozen pounds, and it is doubtful if any specimen ever measured 12 feet. Neither Humboldt nor Darwin found one over 9 feet, but an old male in the Zoological Garden, of London, measures 11 feet.

Whether this greatest of unclean birds is generically distinct from the other great vultures is yet a question among ornithologists, some including in the genus *Sarco ramphus*, the California and King vultures. My own observations of the structure and habits of the condor incline me to say it should stand alone. It is also very certain that, contrary to the usual supposition, there are *two* species of condor on the Andes. The brown kind has been considered the young of the royal black; but it is evidently distinct. The reasons for this belief were given in detail by Prof. Orton.

The largest condors are found about the Volcano of Cayambi, near Quito, and most commonly around vertical cliffs. It is often seen singly soaring at a great hight in vast circles. It never flaps its wings except in rising from the ground. Humboldt saw one fly over Chimborazi; I have seen them sailing at least 1,000 feet above the crater of Pichincha. It a marvelous eater. I have known a condor of moderate size to devour in one week a calf, a sheep, and a dog. It will eat everything but pork and cooked meat. The only noise it makes is a hiss like that of a goose. Incubation occupies about fifty days, ending in April. The young cannot fly till they are over a year old, for up to that time they are as downy goslings. While moulting, they are fed by their companions, moulting time not being uniform. There is a singular difference between the sexes, the eyes of the male being light brown and in the female bright red. The females are also smaller in size, and want the crest and wattle. The toes are less prehensile than those of other Raptores. Professor Orton also gave some new facts respecting the Humming of the Andes as the result of his own observations. The group *Polytmina* comprises nine tenths of known species. Their headquarters seem to be New Granada. Many of them are restricted to very narrow localities. Of the 430 species known, 84 are found in Ecuador. If the wanton destruction of specimens for decorative purposes continues, several genera will soon be exterminated.

Nidification is uniform at the same altitude and latitudes. In the valley of Quito it occurs in April. The nest is built in six days. Some are cup-shaped; others hang like a hammock by spiders' webs, while the long-tailed species constructs a purse-shaped net. Prof. Orton here exhibited several specimens to show how strikingly the nests of the Andean species differ from those of our own hummer—the latter being covered with lichens, and the former invariably with moss. The usual number of eggs laid is two, and these are of a pinkish hue. Incubation lasts twelve days at Quito, and there is but one brood a year, though two in Brazil.

Models for the Patent Office.

Under the new law the Commissioner may, at his discretion, dispense with models when application is made for a patent, but he does not propose to relinquish the requirement except in cases where the invention can be clearly understood without a model. In dealing with our clients we shall be very careful to advise them when we think a model may be dispensed with. Examiners as a rule are opposed to doing away with models, and the case must necessarily be a clear one before they will consent to act without them.

ALASKA FURS.—Notice has been received at the Treasury Department of the arrival of the steamer *Alexander* at San Francisco, from Alaska, freighted with the seal fur product of 1869. She brought 60,992 skins taken on the island of St. Paul, and 24,909 skins taken on the island of St. George, making a total of 85,901 skins, upon which the owners are required to pay a tax to the United States of one dollar upon each skin. The same vessel brought 1,688 fox skins from the same islands, but as the law imposes no tax upon these the question has been submitted to the Treasury officials as to allowing them free of duty.

THE CHASSEPOT AND THE NEEDLE-GUN.—A private letter from an Englishman, dated "Saarbrücken, says: I can't help reiterating that in all the shooting there has yet been the Prussians have had out and out the best of it. Nothing could be worse than the Chassepot at short ranges. We see the Frenchmen spitting on their cartridges, sticking their fingers into their guns, and giving every possible sign that, after a few shots, the Chassepot gets so foul they don't know how to treat it."

CLOGGING OF BOLTING CLOTHS.—Messrs. Glen & Wright, of Atlanta, Ga., referring to a letter from a correspondent complaining of the clogging of bolting cloths, state that the Godfrey Patent Flour Cooler Bolt and Cleaner meets every exigency of the case.

INVENTORS who desire to know in advance respecting the novelty of their inventions, can have a careful preliminary examination made at the Patent Office for a fee of $5. Address (inclosing sketch and description) the publishers of this journal.

The Infection of Rivers by Manufactories.

The continual discharge of the waste of manufacture into adjacent rivers, and consequent impurity of the water, its unfitness for domestic purposes, and its danger to hygiene, have been the subject of an investigation by an English commission, by which some interesting and important facts were brought out.

The little river of Irwel, which flows through Lancashire, is as clear and limpid as a crystal at its source. Two miles and a half from where it rises is Bacup. Before it reaches the latter place, it has already taken up the impurities of nineteen cotton mills, two dye-houses, a printing establishment, one saw and two flour mills. Now Bacup adds to its impurities, and immediately below it follow thirty cotton and woolen factories, six gum factories, tan yards, print works, clay works, saw mills, a porcelain and gas factory. No wonder that at Ramsbottom the river is "infected and black as Styx." At Manchester, however, the Irwel reaches nearly the maximum of impurity, holding 58·8 per cent of solid matter in suspension, and 9·43 per cent of chloride in solution. It has at that point received the waste of *ten thousand* different manufacturing establishments, besides the impurities of the cities and villages on its banks. "In view of such facts," says the report, "we have only one feeling and one word by which to express it—it is hideous." Of course this is one of the worst instances; but there are certainly many which are not much better.

From the conclusions of the English committee, we extract the following: Heretofore, it was believed that the sewage emptied into a river was oxidized at the expense of the oxygen inclosed in the water, and finally disappeared entirely. This would be a very convenient method of purification. Something similar was supposed to take place, as in the case where dirty water is poured on cultivated land, and filters through the soil. After this filtering it is free from impurities; the organic matter has been transformed into carbonic acid; but unfortunately, this theory does not hold true; a mass of impurity is not destroyed in running water, and we must cherish no illusions in this respect. There is only one effective method of meeting the danger; the sewage and waste, before being emptied into a river, must be subjected to a filtration which deprives them of their noxious germs and impurities; it is sufficient to pass them through some porous substance which retains the solid matter, and oxidizes the soluble substances.

The commission has, moreover, established the fact that the irrigation of a large extent of land with sewage water is not attended with any danger to the public health; after a few days the disinfection is complete. The conclusions of the English commission coincide entirely with the results obtained in France by experiments made near Asineres and Clichy, and may be taken as the basis of any regulations which, in due time it may become necessary to adopt in our own crowded manufacturing districts, for the preservation of the purity of our rivers.—*Manufacturers' Review.*

Errors in the Treatment of the Horse.

In the midst of change, improvement, reform, says the Philadelphia *Ledger* quite a number of questionable old notions continue to be followed, even now when the very erroneous character of some of them has been acknowledged. Of this character is the rigid adherence of a majority of drivers of horses to that useless and injurious relic of old times, the check-rein. Its use with draft horses is positively cruel. When a horse is drawing a heavy load, and particularly "up hill," he needs the utmost freedom of lungs and wind, and this he can never have with a tight check-rein. That the check rein prevents a horse from stumbling is more than doubtful; on the contrary, by elevating his eyes, it prevents him from seeing clearly where to place his foot. When a horse does stumble, he is far less likely to go down when his head is left free.

In England, where they are far ahead of us in everything pertaining to horses, the check-rein has been abolished; the last surrender being that of the artillery and commissariat trains of the British army, the change having been made by Sir George Burgoyne, the Commander-in-Chief, and he testifies to the beneficial effects attending it.

In New York city, thanks to Mr. Bergh, many of the finest equipages are driven without the check-rein, and a few humane people have thrown it out of use here. The old-fashioned "blinkers," or blind-halters, are also useless, if not positely injurious, by coming in contact and rubbing the lids of the horse's eyes; and many experienced horsemen long ago came to the conclusion that horses are more easily alarmed by what they hear and do not see, because, being intelligent animals, if they can fully see the objects, which when unseen or imperfectly seen, tend to frighten them, they are more readily calmed.

Another popular error, which bears hard on the horse, is the custom of making the axles of conveyances of all sorts of one uniform width. This custom is of ancient date, and it has caused great detriment to our public highways, both in town and country. It is not, perhaps, saying too much to assert that the uniform adherence to it has caused our Highway Department for the last fifty years hundreds of thousands of dollars. Had there been a latitude or play of from ten to twelve or fourteen inches in the tread of the wheels, especially in carts and wagons, it would have been impossible to have cut our pavements into the ruts we now see, and which renders hauling so difficult along our streets and roads. Like the Connestoga wagons of the last generation, with their broad tires, a difference in the width of our axles would have improved rather than damaged our highways, and we should not see them cut into alternating ridges and ruts, as so many of them are now

HOW TO UTILIZE A HEN ROOST.—A genius by the name of Jeremiah Cory, of Holden, Mo., has recently taken out a very novel patent. The invention consists in so combining and arranging a poultry roost with the gates of one or more bee-hives that the perching of the poultry upon the roost will serve to automatically close the hives. The object is to insure the closing of the hives at night, so as to exclude the bee-moth, and the opening of the same in the morning to permit the passage of the bees in and out during the day. The genius of our people is equal to all emergencies.

A CORRECTION.—A letter published in our issue of August 6th, accredits the building of the steamer *Robert E. Lee*, which lately figured in a race upon the Mississippi River, to Louisville, Ky. Mr. A. S. Roger, Jr., of New Albany, Ind., now writes us that this steamer was built at the latter place, he himself having built her cabin.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

All reference to back numbers should be by volume and page.

G. B., of Ind.—The following directions for soldering aluminum have been already published in this journal. However, for your benefit, and that of other new subscribers, we will reprint them here: "Mouray, of Paris, employs five different solders, which are composed as follows:

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.		
80	85	88	90	94	parts in weight	of zinc.
8	6	5	4	2	"	" copper.
12	9	7	6	4	"	" aluminum.

"These ingredients are melted in a crucible. The copper is fused first, and the aluminum is then added in three or four portions. When the whole is liquefied, it is stirred with an iron rod. The crucible is then withdrawn, and the zinc introduced into the mass under constant stirring. It should be free from iron. The liquefied mass is poured in ingot-like molds, which have been wiped out with benzine. The selection of the solder depends upon the nature of the object. In order to quicken its fusion on the metal, a mixture of three parts of balsam of copaiba and one part of Venetian turpentine is made use of; otherwise the operation is performed in exactly the same manner as in the brazing of other metals. The aluminum solder is spread without delay on the previously heated surfaces to be fastened together. In heating, the blue gas flame or the turpentine blast lamp is employed. The more and oftener the solder is spread over the surface the better it is."

J. H. S., of ——., asks whether in weighing a load on a wagon, by first driving on to the scale the fore wheels, weighing, and noting the result, then drawing off the fore wheels and drawing on the hind wheels, weighing, and noting the result, then discharging the load, weighing the wagon, and deducting its weight from the sum of the two previous weights, the correct weight of the load would be obtained.—If the wagon were constructed so that the fore and hind wheels sustained equal portions of its weight, and if the load were so placed that the fore and hind wheels sustained equal parts of *its* weight, and if the wheels were exactly level at the time of weighing, and if the half of the combined weight of load and wagon in each of the two first weighings rested upon the scale, the position of the wagon being so adjusted in each weighing that this precision could be secured, the correct weight could be ascertained in the manner specified. The chances that all these adjustments could be made under ordinary circumstances, are not one in a billion.

J. R., of Ohio.—We do not believe application of paint in the extreme heat of July or August, will materially aid the chemical changes, which take place ultimately in all paints which contain lead. Although neat facilitates most chemical reactions, the differences between the temperature of what are usually called hot days, and those called cool, in summer, is scarcely ever more than twenty degrees in the shade. The cracking off, and change of color in the mixture of white lead, red lead, and yellow ocher, of which you speak, is doubtless due to some defect in the vehicle, or adulteration in either or both vehicle and pigments.

H. B. G., of N. J.—We do not believe that wetting down the ashes in the ash-pit of your boiler, to preserve the grate, is so good a practice as to rake them out after slicing the fire, though of course the cooler you keep the pit the longer the grate will last. Wetting down with the hose is a "mussy" operation, and helps to disintegrate the masonry. Cooling the pit in this way will not injure the draft, but we should think it would not be necessary with the depth and size of your ash-pit.

P. P. P., of N. Y.—We do not know of any way to make the mixture of gl[illegible] and glycerin, used for printer's rollers, water proof. We do not thin[illegible] there is any way known. None of the chromates or bichromates, or tannin, though acting upon the glue, would, in our opinion, answer for this purpose. If any one knows of any means whereby this can be accomplished, we shall be glad to hear from him.

R. H., of Ohio. The words, belt, band, and strap, are equally appropriate, applied to flexible leather or rubber connectors of pulleys. In this country, belt and band are more commonly used. In English works we frequently meet the word strap used in this way. The word belt is one most in use among American mechanics.

D. L. B., of N. H.—You have, it seems, stumbled upon a well-known fact. If you will take another hardened steel rod, and hold it in the line of the magnetic dip, at your locality, and strike it as before with the hammer, you will develop magnetism in it also, and may count upon the same result, as often as the experiment is repeated.

G. H. M., of Va.—When the attraction and repulsion of the molecules of a mass are in equilibrio, the physical state of the mass is a liquid, and not a solid, as you assume. This error wholly vitiates your conclusions.

J. B., of N. Y.—Your question in regard to the tension of hollow shafts cannot be answered. You appear to be confounding horse power with static pressure.

G. F. M., of Mass.—We think a solid rubber or tanite emery wheel will answer your purpose for surfacing down pieces of plate steel much better than anything else.

H. C. P., of Mich.—We shall publish no more communications upon the subject of inertia at present. The question is one which we think does not generally interest our readers.

Business and Personal.

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