ceiving room. The light of day never enters here; every one is therefore provided with a lamp on his entrance.

Although at the period of our visit the weather was very hot and the village outside was infested by quite a plague of flies whose biting powers were perfect, we saw none in the caves—the coldness and darkness were too much for them. The salting-hall is a spacious vault in which the cheeses are piled up after having received a handful of salt on top and bottom. They are stacked up in threes, and every eight days they are turned. By this time the salt has gradually permeated them, and the floor is covered with a quantity of moisture. About six pounds of salt are used for fifty cheeses. From the salting-room they are carried to the more remote vaults, the temperature of which is still lower. These caves, which are mere apertures in the solid rock, afford that low and even temperature to which is due the success of the Roquefort cheese manufacture. A current of icy air runs so swiftly through these gloomy galleries, that an unprotected candle will be extinguished if held up. In these deep caves the cheeses are scraped, a process which is repeated several times. By these means the residuum of salt and other impurities are taken off. They are then piled up once more, in such a way that a free current of air may pass all round them, after which they are left to dry still further.

The women employed in this duty are very warmly clothed, with sabots, thick woolen shawls tied behind their back, and caps covered with a handkerchief. This toilet appears simple enough, but it is made with coquettish care. The hair is neatly braided over the temples, the cap is brilliantly white, the ribbons gay, and the handkerchief of the brightest colors. Nearly 300 women, most of them young, are employed in these caves; and as one goes downstairs at the entrance, one hears the sound of sabots and voices mingling together in a confused Babel of noises. To your sense of smell, there is the prevailing odor of cheese; to your sense of hearing, not an unpleasant vibration of voices. Indeed, some of these women excel in singing snatches from operatic melodies. A never-ceasing activity goes on in these dark caverns lighted only by the little portable lamps which the workwomen carry about with them. These women are called *canvanières*, and are engaged for a season of eight months at a salary of 200 francs. They sleep in dormitories provided by the cave-owners, who also board them. The dexterity of these cheese-scrapers is very great, and their style of manipulation most rapid. They hold the cheese in one hand, lightly pressing it against the breast, while with the other they rapidly pass the blade of a sharp knife over top, bottom, and sides. In this fashion the *canvanières* remove a certain kind of moldiness which is developed upon the exterior of the cheese under the influence of the cave atmosphere. The whiteness and fineness of this moldiness are held to attest the beneficial action of the caves as a maturing agent. If this moldiness ceases to be white and evenly deposited, and becomes more or less thickly coated and darkly marbled, it is a sign that the ripening process is going on badly. This, however, rarely happens, especially in the older caves. The first scrapings are edible, and are made up into little rolls, which are much relished, and find a ready sale in the country round about. After two or three weeks the cheeses no longer put on a white moldiness. The rapidly hardening cheese now assumes a gray tint, with reddish streaks and blue dots. Still the scraping goes on, but there is considerably less to take off. At length, after a stay of between six and eight weeks, the cheese is in a fit condition to be sent into the market. It has by this time acquired the proper reddish tint, streaked with blue veins.

This is the *fromage de Roquefort* so highly esteemed in France and elsewhere. In the months of August and September it is to be found on the table of every *restaurateur* in France; but if the connoisseur would taste it in its highest perfection, he must wait until the month of November, when, if carefully kept, it will be found of truly exquisite flavor.

## SPONTANEOUS IGNITION IN WOOLEN MILLS.

John L. Hayes, Esq., editor of the *Bulletin of the National Association of Wool Manufacturers*, gives in an article published in the July number of that periodical, some interesting and important facts in regard to spontaneous ignition in woolen mills, a few of which we extract. Much has been said upon this subject, at various times, in the SCIENTIFIC AMERICAN, yet it is of so much importance, that any facts throwing light upon this source of conflagration, or calculated to put proprietors on their guard are always seasonable.

The combustion of oily wool waste, says Mr. Hayes, is familiar to all older manufacturers; that the cases do not more frequently come under the eyes of manufacturers is due to the precautions now generally in use. Mr. Kingsbury, of Hartford, has informed me of two cases which came under his observation where spontaneous ignition had taken place in barrels of oily waste left accidentally in woolen mills. In both cases, the fires were extinguished without damage. Mr. Gould related to me this circumstance: Some years since a large quantity of what was called clean woolen waste, used in the manufacture of coarse satinets, had been brought from a woolen mill, and stored in a wool-house in Pearl street, Boston. The insurance companies having been informed of the fact, notified the party storing the waste to remove it, on pain of forfeiture of his insurance. Objection having been made to the fastidiousness of the insurance offices, Mr. Gould himself piled up portions of this waste in a yard at the rear of his office in State street. The waste was found to be very oily on handling. The pile was exposed in a damp warm day in August. In less than twenty-four hours the pile took fire spontaneously.

Mr. Badderley, in his report on the fires of London for 1853, says, "The most remarkable case of spontaneous ignition that has occurred for some time, occurred at the residence of Mr. Fletcher, at the Library of the Philosophical Society, in George street, Manchester, who, on entering his room one afternoon, found the sofa on fire. Having dragged it into the yard, and extinguished the fire that was burning in the interior, he found, upon examination, that the sofa had been filled with cap bottoms and rovings, woolen materials, which being greasy had spontaneously ignited."

According to Mr. Gould, my informant, a workman who had been polishing a door of a house in Boston with linseed oil, at the end of his day's work requested that his oily woolen over-clothes might be left in the cellar, which was assented to. At half-past eleven at night, the occupants of the house were awakened by the smell of burning woolens. Upon making search from the attic to the cellar, the door of the latter was opened, and a flame started by the admission of the air showed the combustion in the oiled clothes of the workman. A fire took place at the house of Mrs. Colburn, a neighbor of mine, at Cambridge, Mass., from spontaneous ignition of woolen rags saturated with linseed oil, which had been used in cleaning furniture. Dr. Jackson relates a case where a fire occurred in a house newly-furnished, from spontaneous ignition in a pile of chips of oil-carpeting. The proprietor, from excessive caution, slept in the house before it was occupied by his family, and fortunately discovered the fire and ascertained its cause. Upon stating the case to Dr. Jackson, he says, "My floors are covered with oil-carpet chips; why do they not take fire?" "Because," says the chemist, "the chips not being in contact, the heat is conducted away. In a pile, they accumulate the heat originally induced from the drying oil in the chips attracting the oxygen of the air. Can you set fire to anthracite coal spread upon the floor? No: but pile up the lumps so that the heat may accumulate, and they are readily ignited."

The celebrated Mr. Braidwood, for nearly thirty years superintendent of the London Fire Brigade, says, "Sawdust, in contact with vegetable oil, is very likely to take fire. Cotton, cotton-waste, hemp, and most other vegetable substances, are alike dangerous. In one case, oil and sawdust took fire within sixteen hours; in others, the same materials have lain for years, until some external heat has been applied." He observes that spontaneous ignition is generally accelerated by natural or artificial heat.

The danger of spontaneous ignition in piles of charcoal dust is not generally apprehended. The liability of piles of fine charcoal to ignite has long been known to manufacturers of gunpowder. Mr. Hadfield, in a paper containing "Observations on the circumstances producing ignition in charcoal in atmosperic temperatures," published in the "*Philosophical Magazine*," states generally, "If twenty or thirty hundred of charcoal, in a state of minute division, be put together in a heap, and left undisturbed, spontaneous combustion generally occurs." He states the results of a series of experiments tried by him. The following experiment was the most remarkable: "On the 13th of October, 1831, small charcoal was thrown into a heap which covered about ten feet square, was about four feet deep, and contained two or three tuns in weight. In three days, the temperature had increased to 90°, though it was at first only 57°, that of the air. On the 19th, it was 150°, and on the 20th combustion had occurred in several places." He observes, "This experiment was the most satisfactory one that had come under my notice. The charcoal had been made at least ten or twelve days before it was put together, and had been lying during the interval in small heaps freely exposed in the open air."

I have obtained the following remarkable and instructive examples from Dr. C. T. Jackson. They were originally communicated to the American Academy. At the request of several insurance officers, who regarded the facts as very important, they were published in the Boston papers substantially as here stated.

"Three times," says Dr. Jackson, "I have set fire to charcoal at temperatures below that of boiling water. My first experiment or observation was accidental. I was preparing, while at Bangor, Me., for a lecture, in which I had occasion to show an artificial volcano. I took a tray filled with gunpowder and laid it on a stove to dry. I then took a paper of pulverized charcoal, such as is sold by the apothecaries for tooth-powder, the charcoal being wrapped in white paper, and placed it on the top of the gunpowder which was being dried upon the stove. Having occasion to go out, I took off the paper of charcoal and laid it on the table. When I came back, in about twenty minutes, I observed the paper smoking. The charcoal was completely consumed. During all this time, the gunpowder remained on the stove unexploded.

"My next observation was this: While at work in my laboratory, I had occasion to use a piece of charcoal for blow-pipe experiments. I went down into my cellar, and brought up a piece of light, fine, round charcoal, suited for that purpose. It was damp. I laid it on the top of a column stove to dry, directly beside a tin pan containing water, which was not boiling, and never did boil there. I took the charcoal off the stove and laid it on my table. A short time afterward I discovered that it was on fire all through the piece. I laid it aside, and it burned entirely to ashes. The theory of the ignition of the charcoal under these circumstances struck me at once. Charcoal has wonderful porosity: it has the power of analyzing air, and absorbing the oxygen with comparatively little of its nitrogen. The pores of the charcoal were previously filled with moisture. Drying expelled this moisture. The oxygen of the air was condensed in the charcoal, taking the place of the moisture. The condensation of the oxygen produced sufficient heat to ignite the charcoal. I repeated this experiment again intentionally, watching it carefully, and with the same result." The instructive bearing of these remarks will be shown hereafter, in connection with the subject of heating with steam-pipes.

The theory of spontaneous ignition has already been intimated in the observations of Dr. Jackson upon the burning of charcoal. The spontaneous ignition of oily waste and of charcoal proceeds from the same cause—the absorption and condensation of oxygen. We observe that the contact of vegetable or drying oils with porous carbonaceous substances is most promotive of spontaneous ignition. The drying qualities of these oils, which fits them for paints, is due to their absorbing oxygen from the atmosphere. The porous oily materials absorb and condense the air within their pores. Oxidation then commences immediately, and raises the temperature, which again accelerates the oxidation; and the process goes on, with continually increasing rapidity, till at length the mass bursts into a flame. The low conducting power of such a porous mass greatly facilitates the combustion by preventing the dissipation of the heat generated. The massing of the materials in piles, boxes, or barrels promotes the retention and accumulation of the heat, at first excited by oxidation. Moisture also promotes combustion by supplying oxygen. Besides, it has been recently shown that the simple act of moistening such substances as cotton, hair, and wool, is attended with a slight though constant disengagement of heat. It should be observed that the paraffine oils, or the hydrocarbon oils from petroleum, do not absorb oxygen. Dr. Hoffman, the President of the London Chemical Society, warmly recommends their use for lubricating machinery; saying that "they are safer than many of the oils previously used, inasmuch as they no not absorb oxygen, and consequently cannot undergo spontaneous combustion when smeared upon cotton waste."

Managers and workmen should know that spontaneous ignition is not an accidental and exceptionel phenomenon. With the proper conditions, it is as certain as the firing of gunpowder with a spark. The cask of gunpowder, so instinctively dreaded, will not explode till the spark is applied. The pile of oily waste, harmless and innocent to all appearance, slowly but surely takes from the oxygen of the air the means for its own combustion; itself lighting the conflagration, which, most frequently, bursts forth when manager and operatives are locked in slumber.

### The Boiler Explosion at the Indiana State Fair.

The boiler of Sinker & Co., which was in use at the Indiana State Fair, at Indianapolis, exploded on the 1st October, killing nineteen persons and wounding about one hundred persons. The cause of the explosion was, at the time of our going to press, still undetermined.

The scene at the Fair Ground after the accident was most heart-rending. Many of the killed were torn in fragments. In one family, consisting of a mother and three children, the mother was killed and the two older children badly scalded; the youngest was unhurt. A gentleman and lady were walking together; the gentleman was killed and the lady unhurt. Everything is being done to alleviate the suffering wounded that can be done, though it is feared that several will die.

The whole country sympathizes with the sufferers from this fearful calamity, which, although resulting in less loss of life, yet considered in all its aspects is scarcely less terrible than the recent catastrophe at Avondale.

### The Manufacture of Steel.

The Paris *Presse* says:—"An experiment of a most interesting character, and having the highest interest for the iron industry, has taken place at the Marquise Stock Works, in presence of two eminent persons of the Ecole Centrale. The object of this experiment was to make steel by one operation, a problem which has engaged all metallurgists, and if solved, would cause an industrial revolution. M. Aristide Berard, an engineer whose name is familiar to all who have occupied themselves with this question, proposed to change second class metal in course of refining into steel of at least ordinary quality, by means of a process alternately oxidizing and reductive. His efforts have been crowned with success. The product obtained by his process, in presence of two competent judges, proved to be steel of good quality, suitable for all purpose, and made with the facility necessary to its application to practical industry. The operation was effected in a reverbatory furnace, lasted about an hour and a half, and was accomplished with as much facility as puddling. In this process, instead of acting on 480 pounds of metal to obtain iron of number one quality, from 6,600 to 11,000 pounds of metal is made by only one operation into steel ingots ready for the workshop, and with an unexpected economy. We will be much deceived if this invention has not in it the germ of a complete revolution in metallurgy."

A patent has recently been granted for a method of refreshing horses while in harness, which consists in making the bit hollow, and having perforations in it. A rubber tube extends from one side of the bit to the carriage, and by pressing a rubber bag which contains water, the driver is enabled to refresh his horse whenever he chooses, without stopping. For saddle horses the water bag is suspended from the horse's neck, or upon the pommel of the saddle.

CORNS.—The pain occasioned by corns may be greatly alleviated by the following preparation: Into a one-ounce phial ask a druggist to put two drachms of muriatic acid, and six drachms of rose-water. With this mixture wet the corns night and morning for three days. Soak the feet every evening in warm water without soap. Put one third of the acid into the water, and, with a little picking, the corn will be dissolved.—*Jessie Piesse.*

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