

perature of the liquid (or the substance moistened with the liquid) rises, and the liquid becomes turbid with the motion of innumerable vibrations or particles. If the proper kind of fermentation is obtained, the turbidity ceases after the lapse of some days or weeks, there is a heavy deposit of salts, the liquid cools, and a percentage of alcohol, more or less, is found present. Though fermentation occurs in many other substances than liquids, it is proper to speak somewhat of the latter in connection with what has already been said, and also to remark that liquids prone to ferment may have that tendency neutralized by boiling; also, that sulphuric and hydrochloric acids stimulate, and salicylic acid stops fermentation.

The principal fermentations, though there is still doubt and controversy respecting them, may be classed as: 1, saccharine; 2, alcoholic or vinous; 3, lactic; 4, butyric; 5, acetic; 6, mucous or viscous; 7, putrefactive. The first is so closely connected with malting that its effects have been anticipated under that head. The alcoholic is always more or less developed in wine and beer making; but it is the third, fourth, fifth, and sixth which so often occasion "diseases" to beer and ale. In viewing the fire risk of fermentation, however, we must consider the putrefactive form as the chief cause of danger. When a substance is decomposing or fermenting, there is always moisture present in it, or obtainable by it from the air, and a slow combustion ensues, as in the rotting of wood, the decaying of dead bodies, eggs, or the spontaneous ignition of waste, rags, etc., dampened with water or oil, or with both. In fact, if we consider these, and also the oxidation of metals, digestion in animals, and some other chemical changes, we shall see a marked connection between fermentation and combustion.

In all these instances heat is evolved; and spontaneous ignition is a well known source of danger both on land and sea. The principal evidences of this are seen in the ignition of oily waste, damp hay, and substances having strong chemical attraction for oxygen, as soft bituminous coal containing iron pyrites. In some instances of putrefactive fermentation very offensive gases are evolved, such as sulphureted, phosphoreted, and carbureted hydrogen; and under circumstances favorable thereto, these ignite and even explode.

Pasteur, who considers the putrefaction of animal substances as a fermentation caused by animal organisms of the genus *vibrio*, deems that in all kinds of it, fermentation is always accompanied by an incessant change of molecules between the fermenting substance and the "living" cells which develop within it. Liebig compares the action of fermentation to that of heat, by which atomic constituents are torn apart, and caused to reform under other conditions. He also thinks that substances which, like emulsine [vegetable albumen of almonds], contain sulphur and nitrogen, by the changed arrangement of their atoms induce change in the molecules of other adjacent substances, so that they separate into new products; just as [probably] the sulphureted and nitrogenous constituents of yeast act upon sugar, starch, etc., in the formation of beer and ale.

Hallier thinks that the forms which induce putrefaction, fermentation, and mildew are all varieties of one another. He also considers alcoholic and putrefactive fermentations as both due to the influence of a single agent—transfer from place to place in the air of living molecules, which increase and grow wherever they find a suitable soil. It is a curious fact, as shown by Bechamp, that chalk is capable of establishing alcoholic, lactic, and butyric fermentations. He affirms that chalk contains living organisms of extreme minuteness, which he regards as the most powerful ferments known; and he adduces some striking experiments in proof of this theory. When we consider the varied uses of chalk, and how, in the arts, it can be continually in juxtaposition with starch, water, and creosote, which substances were used in such trials, it would be well to be careful of chalk, especially when in powder, as possibly containing a danger not yet sufficiently studied. The fact, however, that brewers have found that yeast does not work properly unless before being added to the fermenting vat it be kept in a warm place until incipient putrefaction occurs, supports the opinion that something more than the presence of organic germs is necessary to induce fermentation, such as *protein compounds* in a certain state of change.

Of all theories which have been advanced to explain fermentation, the old physical contagion theory, originated by Stahl, and reaffirmed by Liebig in 1839, seems one of the most worthy of acceptance. It attributes fermentation to the "mechanical action of certain nitrogenous matters, which are themselves in a state of decomposition, which action is imparted to the sugar [for instance] as soon as it comes in contact with the decomposing elements under favorable circumstances. The more changeable body, by its own inherent instability, initiates molecular movements in a more permanent compound. . . . The access of air is supposed to be necessary only to initiate, by oxidation, the activity of the ferment."

The question of fire risk in sizing is comparatively new, and, like some other subjects, has been forced on the attention of underwriters by the exigencies and changes of the manufacturing business. Originally the size was a simple paste of sour flour and water, with a little alum and tallow added, and put upon cotton warps to prevent the friction of the heddles from wearing away the threads in the process of weaving, and making numerous unsightly little knots in the cloth. Afterward it was adapted, with the addition of China clay and much more tallow, to stiffen calico shirtings, ginghams, and plaids. Now the practice has attained such enormous development that thousands of tons of size are annually used in England alone, and frequently a very excessive quantity is put on the cloth—even doubling its weight. There is much of this weighting already practiced in the United States, and it is likely to increase, for reasons which will appear as we proceed. Sizing is always fermented, which aids its usefulness; and the array of materials now used in it is surprising to one uninitiated. Some of these have, in themselves, considerable fire danger, and, along with this, the possibility of mildew, an excess of loading with size, and the dust from innumerable cotton sized threads while weaving, constitute the fire risk of sizing.

Sizing mixtures for cotton now contain the following materials:

1. For adhesive properties: Wheaton flours, sago, Indian corn starch, farina, rice, dextrine,\* or British gum.
2. For giving weight and body: China clay, sulphate of

baryta, sulphate of lime, sulphate of magnesia, sulphate of soda, silicate of magnesia, silicate of soda.

3. For softening yarns and cloth: Tallow, palm oil, coconut oil, castor oil, olive and other oils, paraffine wax, beeswax composition.

4. Additional for softening and body: Chloride of Magnesium, chloride of calcium, glycerine, soap, grape sugar.

5. For preserving sizing from mildew: Chloride of zinc, carbolic acid, cresylic acid, salts of arsenic, etc.

Here we see greasy and oily materials, such, especially, as tallow, which are melted in separate vessels, and can easily boil over and become ignited from the furnace, as has often happened, endangering an entire mill, perhaps, as the sizing department is often located in the main basements. There is also danger that portions of sizing, swabbed up with waste, may be allowed carelessly to lie in obscure places until spontaneously ignited, which would undoubtedly occur in case of such neglect; and there must be danger to the cloth (if heavily sized and becoming wet) from the sulphate of lime and greasy matter in the size.

Another more constant fire risk is the ordinary, and sometimes excessive, use of sizing on cotton warps, occasioning—through the abrasion and jerking of numerous heddles among hundreds, perhaps a thousand looms, in one large room—a dense atmosphere of dust. Probably one reason why explosions are not yet recorded in England from this cause is the great height of weaving sheds there, and the ventilators in them. Such dust, aided by the festoons and deposits it makes, would, at any rate, most rapidly spread fire; and if mildew existed in the warp sizing, the spores thereof would add untold millions of particles to the other dust. It is noticeable that fires in such establishments are spreading more rapidly. These dangers are even greater in cotton-weaving rooms of the United States, because such rooms are generally smaller, with lower ceilings, and more crowded than in England; but it should also be stated that the plan of English ground-floor weaving sheds is coming into use here among the larger mills.

As Prof. W. Thompson, in his paper on the Sizing of Cotton Goods, read before the Society of Arts, England, argues boldly and at much length, that there is no moral wrong in making the most heavily sized cotton cloths, because the dealers and the Hindoo and Chinese buyers "prefer" them, there is not much doubt that he will find many disciples in the United States pleading the necessity of competition in coming foreign markets. Without discussing this, we would simply point out, that if the old and new markets of the Eastern hemisphere are to be supplied with cotton goods such as the Professor advocates, the fire risk on land and sea will be largely increased. It may be set down as a certainty, that in the near future there is to be a grand struggle between the United States and Europe for ascendancy in these new openings for trade. To illustrate what may attend heavily sized cotton goods in their improper packing, we cite as follows from the able paper named:

"Care in packing is necessary to prevent, as far as possible, the admission of moist air or moisture to the goods, and thus to keep them dry, because nearly all gray cloth goods contain a larger or smaller proportion of size, or flour mixture; and a small amount of moisture settling on the goods, especially in warm climates, would generally result in forming the size into a proper pabulum for mildew; . . . so that, in some cases, they [it] may entirely destroy all the cloth in the bale, making it as rotten as tinder. The action of these fungi are twofold: they grow with enormous rapidity, sending out microscopic filaments much more numerous than the cotton itself in all directions, which penetrate first upon the size, and then upon the cotton itself, converting it slowly, but surely, into carbonic acid and water, the same effects which are produced when the cloth is burned." This might be considered as like iron rusting, a slow and harmless burning, but given certain conditions of oxidation flame will follow. The rusting iron and rotting cotton together would be excellent, fire-wise.

As the Professor did not consider the goods he mentions as too much loaded with sizing, it is evident that overloading must hasten and increase the danger. It is a fact well known to underwriters, that wood long heated by steam pipes, or otherwise, becomes like tinder, or largely reduced from the higher igniting point of solid wood, and ready to burst into flame and burn rapidly on the slightest provocation; and this is the fact in regard to goods such as just mentioned, in which there is continuous charring.

There are, in paper manufacture, other combustible materials used in the sizing, either in the paper pulp or after the paper is finished, which, in process, are an addition to the risk, and affect the storage risk. Common and ordinary printing papers are unsized, but the better kinds, and all writing papers, are sized; and in some instances they are very heavily weighted in the process, and often highly glazed. As recently as forty years ago all the hand made writing paper was sized simply with animal gelatine, and up to about the year 1865 a favorite size for paper was composed of about one part caustic soda to four of resin, with about 5 per cent. of the whole of alum: the last a fire resistant.\* Now the list of materials used for this purpose is as follows: Resin, caustic soda, soda ash, or crystallized carbonate of soda, alum, china clay, sugar of lead, starch, glue, tallow, white beeswax, gum tragacanth, gelatine.

Although all, or nearly all, of these are used in the various sizings of large paper mills, it is proper to state that only resin and soda ash are really necessary; the others, such as clay and starch, are for filling and weight, and alum, tallow, beeswax, etc., added as improvements, or to aid the process of making size. About 5 per cent. of alum, a fire resistant, is a great improvement, if any coloring be used; a moderate quantity of tallow and beeswax prevents frothing, etc., in boiling. Sizings, their proportions and modes of preparation, vary in almost every paper mill; but generally a very concentrated solution of soda ash is first heated in an iron boiling vat, the latter surrounded by a steam jacket, and about four times as much powdered resin added, while the mixture is constantly stirred and boiled for two to four hours. Other ingredients used are added as the boiling progresses; and the latter is usually done by means of live steam, though in some smaller mills, where it is not convenient to use steam, a furnace fire under the caldron is adopted.

The greatest risk of the process is the frothing and accidental boiling over of an inflammable mixture, and its becoming in some way ignited. Where a fire is used underneath, such overflowing is almost sure to be followed by a

flaming of the whole of the ingredients; and in any event, such boiling over is a danger both for the size and other surrounding materials. One of the recent authorities on paper making says: "It has been found by some of our experienced paper makers that the most effective size is obtained, if the resin is dissolved in a solution of soda ash of such concentration that its specific gravity is greater than that of the resin soap. In that case the soda solution remains on the bottom, while the resin soap floats on it, and the soap never boils over while it is being prepared, as it does with diluted solutions."

The mere presence in a paper mill of resin in bulk and powdered, tallow and beeswax in barrels, with starch, the last giving forth the unfailing and dangerous dust, must be a heavy addition to the risk, even if the process of size making be always successful. There is, however, the great danger from the grinding of the resin, which is generally done by an upright, horizontal stone, on a cast iron bed, though sometimes conical upright iron mills are used; and the tendency of these to heat is well known.

In storage, sized paper heats spontaneously to a greater degree than the unsized, but the latter is inflammable to a higher degree. Paper decreases in fire liability as the ratio of weight to bulk increases, other conditions being relatively equal.

Dyeing, in all its processes, was in former years much more simple and of less risk than at present—fuller time was given to cleaning and coloring, many of the colors being more durable than they average now; and drying was better attended to. American and English dyers, as a class, still understand little of chemistry, often not appreciating the risks they run to themselves and the goods by the use of newer substances, and the abuse of those well known. An illustration of this is the explosive nature of the various picrates, several of which are used in dyeing—mostly for yellow. As a mordant, there is used pyroligneous acid (red liquor) mixed with nitric acid and ammonia. Salts of potash, the dangerous chemical qualities of which are well known, are used in cleansing and coloring; among them the noted chlorate is employed, with various decoctions of woods, to obtain rapid oxidation. Chloric acid, potassium, carbon, oxygen—"sufficient unto the day is the evil thereof."

Sulphuric and nitric acids are very largely used, alone and combined with iron, tin, and other metals, as mordants; and if too much of such mordants be used, and not thoroughly washed out from the wool, yarn, or pieces, the finished goods will be deteriorated, or even ignited. We believe that this was the reason of the ignition on shipboard of a case of crimson woolen stockings recently imported into this country. Red is a color requiring a large quantity of acid—so much so, that the harshness and brittleness thereby imparted to the wool and the yarn are but too well known to carders. In regard to the red color in the dyeing process, a curious fact has just been noticed, which shows increased fire jeopardy as yet but little known. During the coloring of cotton pieces a madder red, using acetate of alumina, and running the goods at great pressure through heavy squeezing rollers, and then, for five minutes, through a room heated to 160° F., the goods became heavily surcharged with electricity. The band being suddenly drawn along a piece, a complete shower of fire was observed, accompanied by a crackling noise, and giving a sharp prickling sensation.

Instances could be given here of piles of damp dyed wool allowed to remain too long unaired taking fire in and near the dye house. The dry house is an inseparable adjunct to dyeing, and a very dangerous one. In some cases imperfect scouring and dyeing have caused fire in the drying rooms, and they burning, have destroyed the adjacent main buildings. Some dye houses have attached to them a singeing department, where the piece goods are passed over red hot cylindrical copper bars, or very rapidly through the flames of gas. In general there is not much risk from direct application of fire in dye houses, as steam is chiefly used for boiling vats and for drying rolls, but in some smaller places and in some silk dye houses sheet-copper vats are used, and are heated by wood or coal in furnaces, each under the bottom of a vat. This is, of course, a considerable addition to the risk. We will mention briefly, in closing, the danger of ignition of black skein silk and silk goods, which have been heavily weighted in dyeing. Instances have occurred frequently in storehouses in the most valuable parts of New York city, on board of large steamers from Europe, and on wharves in New York and Philadelphia, which were crowded with goods. Some remarkable escapes have been made from fire through this cause, but considerable fires have also resulted.

The weight of silks of various colors can be increased in dyeing from 10 to 40 per cent. without danger, so far as is known; but black will take so much weighting, and the temptation is so great, that frequently this color is increased by loading 150 to 200 per cent. Such silks are rather rough, attract dust easily, and, if heated to 230° F., fall to pieces. The volume is at the same time increased, and the fibers, as seen by the microscope, are much swollen.

In regard to dyeing, the remark is proper, and it will apply to the three other departments already discussed, and to many other arts, that the fire risk in them all would be largely diminished if we had in the United States more, and more thorough, polytechnic and industrial schools, to teach chemical and mechanical knowledge to young men, and thus bring forward a class of more intelligent experts in all industries. As incentive to all striving with honorable ambition for eminence, we would say that former so-called "learned" professions are falling behind in the intellectual race, and that the scientific mechanic will be the great man of the future.—*Amer. Exch. and Review.*

#### THE MEDICAL USES OF MUSIC.

By GEORGE L. BEARDSLEY, A.M., M.D., of Birmingham, Conn.

THE spells of music have always been themes for speculation. The earliest inquiries concerned this loan of Apollo to man. Melody was no sooner revered than its birth was deciphered, and among the primitive calculations was the mission of song. Its winsome appeal to passion; its faculty of lulling heartache, scattering the vapors of a burdened spleen, or smoothing the rugged pathway of grievous duty; its aid to genius; its friendship to humor; its inspiration to holy offerings—these varied values of melody touched the harpstrings of the early student and made him sing of music as of some far off welkin descended, the offspring of the rustling river-reeds, or the whispers from well-disposed Olympus.

Its startling energy in animating, and curious ascendancy over morbid experiences, suggested its utility long ago as a cure for pain, equally as a method of worship or an overture for assistance.

\* The quantity of this rather dangerous substance, which changes to sugar with remarkable facility, may easily be increased from the flour and sago and starch. † Moist starch flour, containing 10 to 20 per cent. water, will, in a closed vessel, under the simultaneous influence of steam and increased pressure, change readily, at a temperature of 320° F., into dextrine.—*Johann Frankel, Prac. Treat. on Starch, Glucose, Starch Sugar, and Dextrine. Philadelphia, 1881, p. 26.*

\* Alum, a sulphate of alumina and potash, derives its incombustible character from the alumina, and in association may become an ignitive. One of the pyrophori, or spontaneously ignitable powders, is made by an intimate mixture of alum and sugar, the two being first dried, then charred in an open pan, and afterward heated to redness in a closed vessel; something of the inflammable conditions of sulphide of potassium is thereby produced.



Pythagoras, who referred the origin of melody to the gambols of the spheres, prescribed sonnets to those laboring under aberration of mind, whether sensible or feigned. His trials of it were confined to those who were fretted by delusions. Sacred writ instances the power of sweet strains to break vials of wrath, as in the case of Saul incensed against David, who exhibited a species of mania, or madness fed by jealousy, which condition is, according to the present reading of the mind diseased, a variety of true derangement. It is affirmed of the wise Thales that under his auspices an imminent plague was banished from Sparta by the skillful exercise of musical instruments. The probability of such an antidotal element in minstrelsy lacks warrant in the light of the current views on the genesis of disease, but the notice of the story sustains the statement that the ancients expected a virtue in music to operate against the disorders of nature.

Capella, who flourished in the fifth century and wrote a quaint compound of allegory and the liberal sciences, relates the prescription of music to cure fevers and tells of its positive success. Hearing is reported by Asclepiades to have been restored by stimulating the organism with frequent blowing of a trumpet. The same practice of playing the lyre and singing lays before mad patients (apparently first suggested by Pythagoras) was continued by Xenocrates, who figured among the Greeks in 396 B. C. The confidence in the serviceableness of music in disease does not appear to have waned as successive experiments measured its utility—the indications for the remedy rather increased, for in the writings of the popular Greek schoolmaster Theophrastus, cases are detailed of the cure, by music, of rabies and the shock or depression induced by the bites of vipers or venomous serpents. Not all these reports are to be received as the sportive wiles of some deft juggler—they are far from the impossible. The terror of wounds inflicted by rabid animals and that black despair so proverbial a symptom among those thus bitten are remediless save by exorcising or some sort of machination of electro-biology that shall charm away the bugbear. Reason's discourses to a hydrophobic patient are not sovereign, and the use of sounds in silvery cadence may be a remedy yet to be appraised as prolific of comfort as the amulet or the royal touch.

In the second century Aulus Gellius, a Roman grammarian, and author of the "Attic Nights," described a case of sciatica cured by harmonics. In the later medical literature the employment of incantations to ease pain and pacify the Furies is often noted, and the measure is recommended with emphasis not repulsive. In the time of Luther the people were profoundly impressed with the special antagonism of mellow airs to the wiles of maleficent beings. This zealous propagandist of a new confession defined music as a "bitter enemy of Satan." The persuasion that mellifluous sonatas are not congenial to the devil, and that insanity in all its varieties, for ages expounded as the curse of an angry god, can be appeased by the richest euphony, is not discredited, nor lightly esteemed among those who determine law to disease.

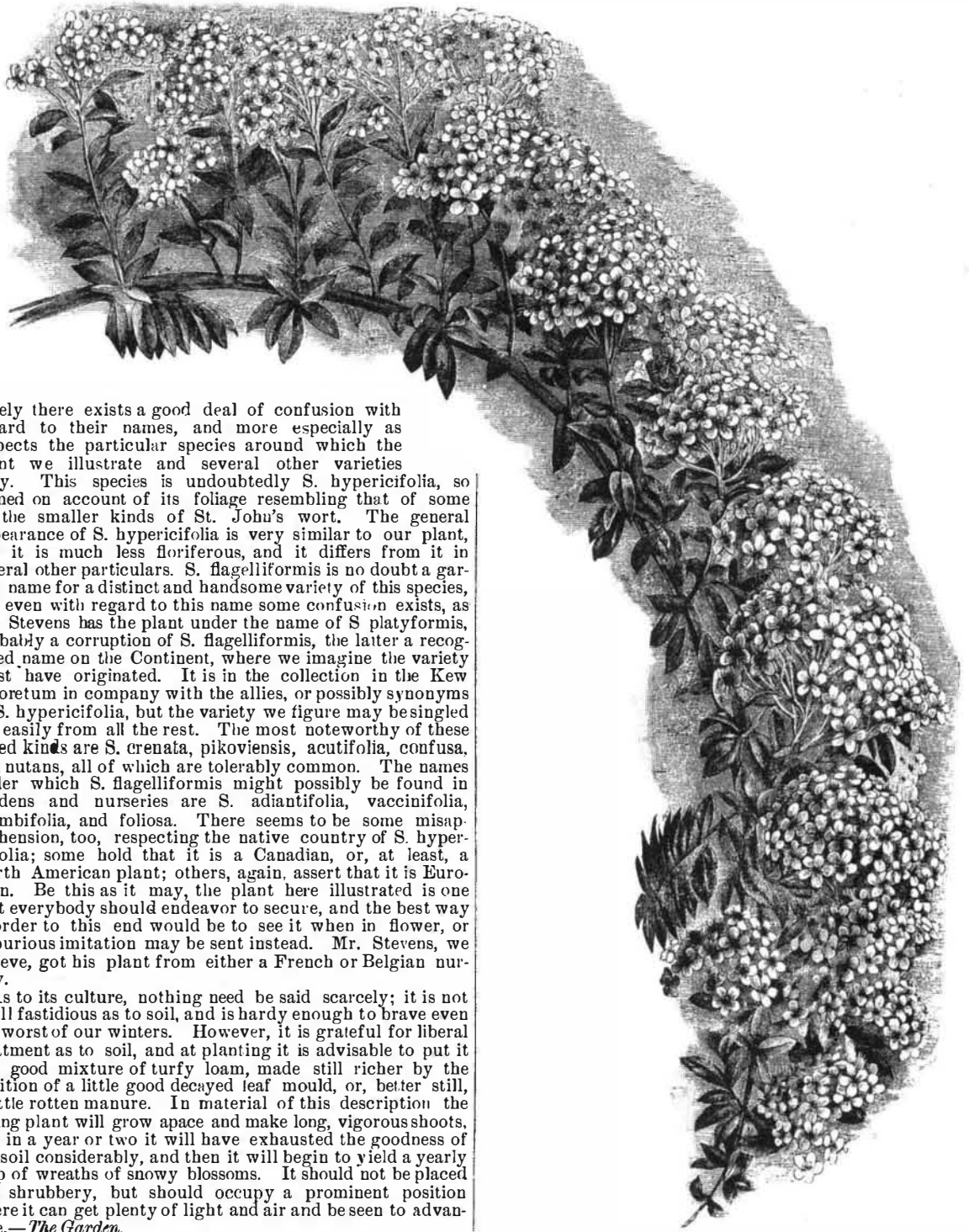
The use of music, now preferred in insane asylums, is an evidence that we are possessed of a clearer ken of the maniac's disturbance. This is an era in which the sentinels of science are gaining ground surely—when heathen frauds are being buried at wisdom's gate, and ere long it may be affirmed of the pioneers in the healing of the mind diseased that in the "golden tongue" they have found a sway over grim despair.

The same data which made sensible the service of modulations with the insane will explain the propriety of doctoring any of the other disturbances of the nervous system, particularly the functional, with minstrel performances. The notion that mirth is bracing and that the hornpipe mocks a funeral is no raw increment to reason's capital. The ancients had a saw that the three best physicians were "mens laeta, requies, dieta moderata." Macbeth, when he "throws physic to the dogs," forgot to ask for pipes and whistles. The charms of music are as far-famed as Eden's serpent. In sickness its persuasiveness seems irrefragable, and full many a time when decay is long spun out and death defers his call to fill full the cup of gnawing weariness, harmony comes as pain's seducer. To those suffering ideal ills, or who can call up any ache at leisure, the dyspeptic, the man with clogged liver or big spleen, the brigade of victims not of youthful indiscretions, but inmates of painted sepulchers and patrons of white-robed medicasters, to all these pilgrims of Despond some terpsichorean strains, the soul-stirring symphonies of a Mozart, the rollicking choruses of a dandy troupe, the thrilling anthem, the melting ditty, will dispense the nepenthe that no drug depot ever inventoried. The story told of Farinelli curing Philip of Spain of suicidal intentions, induced by ill health, is a valuable confirmation of the possibility of controlling nervous depression by sonatas. Philip had passed into a state of profound despondency, continuing thus for days, secluded, not even willing to have an attendant to shave him. The Queen, confident that music would unyoke the bond of cold melancholy, ordered a concert to be given in a room near the King's chamber. The ravishing warbles of Farinelli at once overcame the King, who ordered the singer into his audience. Farinelli continued the soft impeachment until the King consented to resume his duties, was shaved, and appeared in public. To make the cure genuine, the Queen required Farinelli to sing daily for some time. No return of the "blues" to Philip, King of Spain, was ever afterward noticed. The affection mal de pays, or nostalgia, is said to be greatly amenable to minstrel ditties—the banjo may yet be found a specific for homesickness. With the Romans female musicians or psaltria were hired to play before the love-lorn; the Swiss were fired from withering despair to courage dreadless by the Rans des Vaches; the Pibroch made the Scot wax hot to die a hero. It is not the courage of wild fiction to conclude that the South Germans rarely resort to suicide because of music's grip on madness, and more than one to-day whose griefs of digestion or cultivated cough has made a rover after Siloam's waters, would forget all twinges if once moved by the electric trills of a Jenny Lind, a Gottschalk or a Paganini. The gospel of sweet rhyme has not yet been proclaimed of all its affluence. The rewards of song will not be ripe, nor can its coronation be confirmed until the energy hid away in music's sanctuary is brought out, and made to combat every pain that does violence to temperate reason or nice content.—*N. E. Med. Monthly.*

A NON-CONDUCTOR of electricity has yet to be found, for all substances hitherto discovered are conductors of the force under certain known conditions; but those which offer a great resistance to it serve the purpose of non-conductors in practice, although they may be all classed as good or bad conductors. The best conductor known at present is silver; the worst conductor is solid paraffine.

#### SPIRÆA FLAGELLIFORMIS.

A GLANCE at the annexed illustration will make our readers better acquainted with the elegant beauty of this *Spiræa* than any written description could possibly do so. It is, we consider, one of the most beautiful of all *Spiræas*, and unquestionably the finest of the white flowering kinds. We met with it last summer in Mr. Joseph Stevens' richly stocked garden at Grasmere, Byfleet, and thought at the time that we had rarely seen a shrub possessing such a combination of gracefulness and beauty. From a spray of this bush our drawing was made. It is a slender growing, wiry twigged shrub, ranging from 3 feet to 6 feet in height in favorable soils and localities. During the latter part of May and the beginning of June each of the preceding year's shoots is densely wreathed with small, erect clusters of white flowers as in the spray shown in the illustration. When a good sized bush is thus furnished with blossoms, its beautiful appearance may be better imagined than described. This *Spiræa* belongs to that section of the shrubby class characterized by their flowers being produced in hemispherical corymbs or loose umbels. These species and varieties belonging to this section are more numerous than in any other, and unfortu-



SPIRÆA FLAGELLIFORMIS.

nately there exists a good deal of confusion with regard to their names, and more especially as respects the particular species around which the plant we illustrate and several other varieties rally. This species is undoubtedly *S. hypericifolia*, so named on account of its foliage resembling that of some of the smaller kinds of St. John's wort. The general appearance of *S. hypericifolia* is very similar to our plant, but it is much less floriferous, and it differs from it in several other particulars. *S. flagelliformis* is no doubt a garden name for a distinct and handsome variety of this species, but even with regard to this name some confusion exists, as Mr. Stevens has the plant under the name of *S. platyformis*, probably a corruption of *S. flagelliformis*, the latter a recognized name on the Continent, where we imagine the variety must have originated. It is in the collection in the Kew arboretum in company with the allies, or possibly synonyms of *S. hypericifolia*, but the variety we figure may be singled out easily from all the rest. The most noteworthy of these allied kinds are *S. crenata*, *pikoviensis*, *acutifolia*, *confusa*, and *nutans*, all of which are tolerably common. The names under which *S. flagelliformis* might possibly be found in gardens and nurseries are *S. adiantifolia*, *vaccinifolia*, *rhombifolia*, and *foliosa*. There seems to be some misapprehension, too, respecting the native country of *S. hypericifolia*; some hold that it is a Canadian, or, at least, a North American plant; others, again, assert that it is European. Be this as it may, the plant here illustrated is one that everybody should endeavor to secure, and the best way in order to this end would be to see it when in flower, or a spurious imitation may be sent instead. Mr. Stevens, we believe, got his plant from either a French or Belgian nursery.

As to its culture, nothing need be said scarcely; it is not at all fastidious as to soil, and is hardy enough to brave even the worst of our winters. However, it is grateful for liberal treatment as to soil, and at planting it is advisable to put it in a good mixture of turfy loam, made still richer by the addition of a little good decayed leaf mould, or, better still, a little rotten manure. In material of this description the young plant will grow apace and make long, vigorous shoots, and in a year or two it will have exhausted the goodness of the soil considerably, and then it will begin to yield a yearly crop of wreaths of snowy blossoms. It should not be placed in a shrubbery, but should occupy a prominent position where it can get plenty of light and air and be seen to advantage.—*The Garden.*

#### FLOWERS IN WINTER QUARTERS.

To the Editor of the Scientific American:

Flowers under the snow are an anomaly rarely met with. We associate them, rather, with the genial warmth of the spring and summer sun. Yet one of our commonest weeds, as will be seen, defies the frosts and even maintains its blossoms under the snows of winter.

My attention was called last autumn to the comparative sensitiveness of various plants to cold. While the least observant person will not fail to note the sad havoc which an unexpected and premature frost makes among his garden herbs, he may not observe that in the field succulent and delicate plants, and especially the ferns, share a like fate. One by one the wild flowers droop before the chilling breath of this destructive agent.

By the first of December, when Nature has laid aside her many-colored autumnal robe for her somber dress of brown, we find but few of the hardier plants still lingering. Among these was noticed the *Stellaria media*, Smith, or common chickweed. It continued to blossom up to the 3d of December, when in this latitude winter silently spread her mantle over the face of nature. Wishing to ascertain the condition of this plant in midwinter, some of it was excavated on the first of February, and was found in an apparently flourishing condition, though buried beneath a foot or more of snow. A close examination showed it to be in possession of buds, perfect flowers partially open (but for the most part closed as at night), and fruit in all stages of development. The dull green leaves and tumid stems suggest a decidedly frozen condition, but the tendency to wilt may be overcome by placing the plants in cold water immediately after their removal

from the ground. They may afterward be dried or kept in water, when the buds and flowers will gradually steal open.

In this introduced and inconspicuous weed, we have an example of a plant which does not succumb to the cauterizing frosts and snows of our northern winter, but preserves its blossoms uninjured in the snow. Its persistency is most remarkable. The last to close in autumn, it is the first to unfold its petals in the spring, and may be seen in blossom in favorable places, where the snow has disappeared, on any warm winter's day. It seems thus to be more of a perennial than an annual plant. Possibly the *Capsella bursa-pastoris*, Moench., which we have seen in flower in the latter part of November, and other plants of this hardy nature, may have a similar history.

Those, however, which we have mentioned have their rivals for hardihood, among which may be noted the *Hammamelis virginica*, L., or witch hazel. Its bright yellow tassels, hardly noticeable at another time, are then conspicuous both by their uncouth shape and by appearing when its own leaves are sere, on the very verge of winter.

The plant which on the whole should be considered the harbinger or usher of spring is the *Symplocarpus foetidus*, Salist, an enterprising but obnoxious herb; it pushes up its

horn-shaped spathe in some seasons by the last of February, and appears in flower in March, while the snow is still retreating. Its own advancement may serve to test the progress of spring.

It is not likely that vegetable life wholly ceases at any time of the year. The buds of many trees gain in size every warm day through the winter. Those of *Salix discolor*, Muhl., may be seen considerably expanded by the first of February. The aquatic plants, also, which are slowly and imperceptibly unfolding, are quickened by the advent of spring. Lower orders might be mentioned, such as *lichens*, which are perennial in all latitudes, being so indifferent to temperature as to abound above the snow line of mountains, and requiring little but pure air and moisture for their sustenance.

Thus the severity of winter, however it may conceal and retard the functions of vegetation, does not wholly suppress them.

F. H. HERRICK.

Rock Point, Burlington, Vt., Feb. 8, 1883.

#### THE SUNFLOWER.

THE sunflower does not turn with the sun, but a recent observer finds that a majority of the flowers do have a prevailing direction when opening. In the case of one of the perennial sunflowers (*Helianthus mollis*), of sixty-eight flowers, up to one time all had their heads inclining to the southeast. Three days after this, with seventy-three flowers open, twenty-one (among the older flowers) had advanced toward the northeast, their horizontal faces becoming nearly erect during the journey.