Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, SEPTEMBER 24, 1881.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 299,

For the Week ending September 24, 1881.

Price 10 cents. For sale by all newsdealers.

STORAGE OF HEAT.

Among the many curious phenomena connected with crystallizable metallic salts, especially those of the alkaline bodies, one of the most interesting is the great influence exercised upon temperature during the solution of such crystals.

It is known that when, for example, a glassful of crushed sulphate of soda (Glauber's salts) is sprinkled with muriatic acid, it becomes liquid, and its solution is accompanied by a degree of cold so intense as to cause any water placed therein, in a second vessel, to freeze; and almost every schoolboy is aware that when common salt is allowed to become dissolved with a quantity of snow or crushed ice the temperature is reduced many degrees below the freezing point. Without going into the subject of the conservation or even the correlation of force, which underlies all actions of this nature, it may be stated that by reversing the experiments just cited *heat* is produced. Take a thin glass bottle, fill it nearly full of hot water, and dissolve in it sulphate of soda to saturation; then, while nearly boiling, cork it tightly and allow it to get quite cold. It will be seen that no crystallization takes place, although the water is supersaturated. Now remove the cork, and speedily the whole becomes a solid mass. What we desire here to be noted is that the act of solidification is accompanied by heat, a fact palpable to any one grasping the bottle.

The presence in water of solid bodies, no matter in how fine a state of division, does not alter its boiling point; but no sooner is a crystallizable salt dissolved in water than the boiling point is at once raised, and different salts raise it to different degrees. By direct experiment Professor Tomlinson ascertained that by making saturated solutions of the following salts the boiling point was raised from 212° Fah. to that degree placed opposite to each:

Acetate of soda	256 degrees.
Nitrate of soda	246 "
Nitrate of potash	238 "
Sal ammoniac	236 "
Common salt	224 "
Sulphate of magnesia	222 "
Alum	220 "
Chlorate of potash	218 "
Sulphate of copper	216 "
Sulphate of iron	216 "
Acetate of lead	215 "
Sulphate of soda	213 "

An examination of this table shows that there is one salt which far excels all others in its property of raising the boiling point, namely, acetate of soda.

Quite recently an invention of an interesting nature has been made in which this salt is the chief factor; an invention which, divested of scientific language, may be stated to consist of the property of the acetate to absorb heat when subjected to it for some time and then to give it out afterward over a prolonged period—in effect to store up heat, which, owing to crystalline changes in the salt itself during the act of cooling, is continued to be evolved from the latent into an active form. That this is the case is indicated by the fact that the vessel containing the salt, after having been two hours removed from the source of heat, has its temperature raised about 6 degrees Fah. during the third hour by its own inner forces alone.

The physical principle upon which this curious invention is based is old and well known, although the application of the principle is novel. The form in which we have obtained a specimen "heater" consists of a somewhat large flask formed of thin sheet brass having its mouth soldered up, for it is never intended to be opened. There is also a metallic loop by which to suspend it in the vessel of boiling water from which it is to derive its store of heat. The length of time required for immersion in the hot water depends upon the size of the heater; for example, if it be so small as to be suitable for being carried in a lady's muff, by which to keep her hands warm, four or five minutes will suffice; but if, on the other hand, the dimensions be such as enact the part of a foot warmer, this time would have to be increased by six or eight times. There are some so large as to require immersion in boiling water for an hour before they are fully charged with all the heat they are capable of storing.

While the length of time over which heat is given out depends entirely upon the dimensions of the flask containing the acetate of soda, it may be roughly estimated as about four times as long as hot water will retain its heat. A foot warmer which upon removal from a vessel of hot water was found to register 153° Fah., at the end of eleven hours registered 111°. The most sudden fall took place during the first two hours, after which the temperature rose a few degrees, gradually subsiding afterward until it became quite cold. In the case just adduced the foot warmer fell from 153° to 126° in two hours; it then rose during the next hour to 131°, taking eight hours to fall from 131° to 111°, which it did with uniform regularity.

There are various purposes to which M. Ancelin, of France, the inventor of this new application of acetate of soda, intends to apply it. One or two have been hinted at in course of these remarks; others, such as keeping food or dishes warm at a distance from a fire, will suggest themselves.

THE Upper Ohio River steamer Telegraph lately left Huntington, W. Va., with twenty car loads of freight on board, drawing 3½ feet of water. The Telegraph is one of the finest and fastest passenger steamers on the river. Her length is 290 feet.

OPENING OF GREAT INDUSTRIAL EXHIBITIONS, BOSTON.

Boston has for many years had an annual Industrial Exhibition of some importance, under the auspices of the "Massachusetts Charitable Mechanic Association." This year it will have two of these "grand fairs," one having been inaugurated Aug. 18, and the other promising to open its doors Sept. 13.

The one first in progress is under the auspices of the "Manufacturers' and Mechanics' Institute," which is in some sense an offshoot or rival of the older organization, though only in a friendly way, and the result is that Eastern industries and progress will be represented in these fairs more completely than ever before, as the men at the head of each have worked hard to make the best show possible. Two large and beautiful buildings have been erected, both of them with some architectural pretensions, the newer association, however, having the largest, covering five acres of ground, and giving with the galleries nearly ten acres of floor space, and the Exhibition now open is much more imposing than any the country has had since the Centennial.

There are so many specialties of great interest to all inventors, mechanics, and manufacturers, as well as the general public, in any great show of this kind, that it is difficult to pick out for mention only such things as would be novelties to one who had kept fully abreast of the progress of invention and the improvements in machinery. The fair is, however, particularly representative of the cotton and woolen factories and machine shops of New England. The great corporations of Lawrence, Lowell, and Fall River, Mass., Manchester and Nashua, N. H., Providence, R. I., and other places have on exhibition probably the best display of their productions that was ever made. But to properly appreciate the variety and beauty of the fabrics they must be compared with those made at the same mills or imported from abroad only a few years ago, when the greatly enlarged capabilities and improved workmanship of the factories to-day stand out in high relief.

In the machinery for the manufacture of these goods the exhibition presents a comparatively small assortment, although covering some important and recent improvements in looms, carders, and mules. The deficiency in this department is due to the fact that many who would otherwise exhibit here are to be fully represented at Atlanta, but it will be somewhat amended in a few days by the tardy ones who are late in putting up some novelties in cotton and woolen spinning.

In the boot and shoe manufacture the Exhibition leaves nothing to be desired. This is by far the leading feature of the show and attracts crowds of visitors, for never before was this industry, in all its departments, so completely arranged to give the public ample opportunity for an examination into the way in which boots and shoes are made. By a happy conceit also, an aged shoemaker, working by hand after the old style and sitting on a shoemaker's bench which had been used by two workmen for a hundred years, occupies a prominent position, as he laboriously "pegs away in the midst of these modern surroundings." About 100 men work here, the machinery running from 9 A.M. till 9 P.M., and the production being about 600 pairs a day.

The leather comes to the Exhibition building direct from the tanneries and currying shops, the sole leather in sides and bundles, and the upper in rolls. The latter is all cut out by hand after patterns, as the workman has to examine the leather carefully to see that particularly strong and good parts come on the vamp or forepart of the boot or shoe. The soles, insoles, and taps are died out by machines which, to an outsider, look far larger than they need be, but this is so that a whole side may come under a cutter's eye at once, and he can place his die so as to save stock, cutting first the thickest parts into outsoles, and the remainder into taps, insoles, and heels.

The uppers, after cutting, are wet, and then passed through a powerful machine which crimps and forms them, drawing the leather out so that it can be lasted easily into proper shape. There are four of these machines. The fronts and backs of the uppers are then sewed together by a machine, which, after a long process of development, has been made about perfect for this kind of work; after which, with the inner sole, it is taken to a lasting machine, and these two parts made temporarily firm over the last. This last part of the work is something for which inventors have long been trying to perfect machinery, but nothing so far brought out has yet been generally adopted, and the machine here in use for this purpose leaves much to be desired.

After the boot or shoe has been lasted there are four different ways shown here of putting on the sole—screwing on with brass screw wire, pegging, sewing direct through from inside to outside, and sewing on with a welt in imitation of handwork. The brass screwing makes the firmest fastening for heavy work, while it does not make the sole unduly stiff and hard; the wire is actually screwed in, so that it does not break and tear the leather. The pegging machine has long been a familiar object at exhibitions, but it is always interesting to the public. The putting on of the bottom with a welt requires two machines, one of which works with a curved needle in a section of a circle, the inner sole, upper, and welt being first sewed, and then the outsole to the welt. This machinery has been improved through several years, until the goods made by it are now meeting with considerable public favor, for they meet that demand for flexibility with firmness of sole which many people think are only surely obtained with handwork.