inner cone or steam cylinder from whence it is drawn to the engine. The circulation of water in this boiler appears to be as near perfection as possible, and its evaporating power is evident from the great fact that twelve and a half pounds of water has been evaporated by one of coal. We shall have occasion again to refer to this generator.

Two large engines, one in each corner of the room, furnish most of the power to drive the machinery, although there are a number of smaller engines on exhibition. The engine in the eastern corner is from the Washington Iron Works, Newburg, N. Y., and has Wright's patent variable cut-off, which is worked by the governor. The engine is finely finished and performs its work noiselessly. The valves are poppet valves, operated by trippers. Except their working, the machine is almost perfectly noiseless. We have not yet seen any cards taken from the engine. It is to be soon indicated.

At the other end of this division is an engine from the Hope Iron Works, Providence, R. I., called the Babcock & Wilcox Engine, that runs the western half of the machinery section. It is externally very simple in appearance, and the valve motions are governed by the regulator, as in the other machine. Slide valves instead of poppet valves are used in this engine, a circumstance which may commend this engine to many mechanics. It is certain that the engine performs its work with great smoothness and perfect regularity, a statement that is worthy notice when the circumstances of its work are taken into consideration.

We have not time further to particularize the objects exhibited, only to advise those whose time will admit of a detailed examination, to visit this exposition of the arts, and those who cannot spare that necessary time, to take at least a leisurely walk through the immense building.

## SALT IN THE ANIMAL SYSTEM.

In No. 13, current volume, we copied a brief paragraph from a medical journal which denounced the use of salt as a condiment, stating that it was "never useful; always injurious." The following will show that "doctors disagree:"

Herr Schultz, a chemist of Berlin, claims, after long and patient researches to have found the cause of electricity in human bodies. He attributes it to the presence of chloride of sodium, or common salt, in the system. In his experiments he asserts that the amount of electricity was always in direct proportion to the quantity of chloride of sodium found in the tissues. He would advise, therefore, all invalids suffering for electricity in the system to use salt liberally with their food, and to avail themselves freely of the benefits of ocean breezes and baths.

There can be no reasonable doubt of the benefit of salt to the human body. It would seem as superfluous to discuss the propriety of using common salt with our food as to argue the healthfulness of water or bread, as salt has been almost universally used by both men and animals since the creation of the world. "Salt," says the *Encyclopædia Britannica*, "forms an essential constituent of the blood, the loss of saline partic es therefrom by the secretions, the tears, the bile, etc., being repaired by the use of common salt as a condiment." And further, "The gastric juice of the stomach contains free hydro-chloric acid, which is doubtless derived from salt taken with food." In *Brande's Encyclopædia* is the following statement: "Salt is next to bread the most important necessary of life." *Stockhardt's Chemistry* says: "We find common salt everywhere in nature, because it is indispensable to the life of animals and plants." In fact and in short, digestion and even life itself would cease were it not for the presence of salt in the human system.

## Indestructible Railway Sleepers.

Numerous attempts have been made to render the timber sleepers on railways more durable by enabling them to resist the destructive action of damp and moisture. Experience has shown, however, that the results produced have not been pro portionate to the extra cost incurred. The average length of prepared sleepers has been found to be about five years, or, considering the additional cost, showing but a slight increase of longevity over the timber in its natural state. Some of our railway managers have accordingly decided upon abandoning the use of prepared sleepers on their lines. A process of indurating has, however, been brought under our notice during the last week which promises results of a most satisfactory character, and which is well deserving the attention of managers of our railways. The inventor of the process is Colonel Szerelemy, whose name is well known in connection with the preservation of portions of the stone of the new Houses of Parliament. The material employed possesses, we are informed, qualities in many respects identical with that which has so remarkable an effect upon the surfaces of stone. Applied to timber the preservative effects are very remarkable, as instanced in the specimens which were submitted to the inspection of a number of scientific gentlemen last week. They were treated by the process in 1851, and were shown in the exhibition of that year.

Like many other germs of great inventions, which were passed over unnoticed at that time, these prepared sleepers did not attract the attention which they deserved. Besides, being but newly treated, the inventor, though perfectly convinced of the completeness of the induration which he had effected, could not appeal to that test of experience which is considered alone sufficient to satisfy the minds of practical men. When the sleepers were removed from the exhibition building they were buried in the ground, and, if not wholly orgotten, they have been, at least, undisturbed, until the recurrence of the exhibition at Paris has directed anew the attention of Colonel Szerelemy to the existence of those sleepers of sixteen years ago. The timbers were accordingly unearthed, and to the surprise of many, though certainly not of the inventor himself, the timber is as sound as on the day when it first came into his hand. The sleepers thus prepared are now on view at the Albion Works, Battersea, and managers of railways and of other public works, who really desire to keep down working expenses, would do well to pay a visit to the place, and ascertain for themselves the value of this mode of treatment. We believe that some astute Americans, who have profitted by their visit to the Paris exhibition, have within the last week purchased the rights of the inventor for the United States.—*London Railway News.*

## Art and Science.

The Jaquard loom and the lace weaving machines of Nottingham, together with the numerous inventions for weaving or knitting stockinett—the machines with which our carpets are wrought, demand our admiration, and we feel proud that our social institutions have led to results so satisfactory. The recent improvements in the manufacturing of dyes, yielding colors so pleasing to the eye, from substances formerly considered waste, is surprising to all of us, even though we know the various steps by which the discoveries have been made. But with all our boasted progress it is doubtful if we have in all respects surpassed some of those nations which we regard as half civilized. M. Huc speaks of seeing in Central China, some thirty years ago, a cast iron figure of one of their Grand Lamas, weighing at least 25 tuns, so nicely cast, that although in about 80 pieces, yet it had the appearance of a solid casting. And it is well known that in architecture, some of the cities of Northern India are not surpassed by anything European. The beautiful light fabrics made from the fibrous blades of the pineapple, by the unaided fingers of the Persians, are well imitated by Europeans, but not surpassed in lightness and evenness of texture. To rival the famous shawls of Cashmere, they have produced articles worthy of admiration, but they fall short of the productions of the original makers. The amount of labor the finer shawls of Cashmere represent, makes it impossible for Europeans to compete with Asiatics, even if the patience and skill were equal. The Vale of Cashmere will stand unrivalled in this particular line of production until laber become so cheap in other countries, or society there receives some impulse which shall raise the price of labor to an equality with the rest of the world. There has been many efforts to produce the material in other countries, but the quality quickly deteriorates when the animal is removed from the peculiar clime of its native vale. Even a short distance changes the quality of the fibre, so much, that to prevent imposition the Maharajah has taken the inspection of the shawls into his own hands, so that now the inferior goods of the adjacent districts cannot be sold under the well earned reputation of real Cashmere. There is a capacity to take colors in the real Cashmere that is a distinct mark to those acquainted with the goods, and the success of the dyers must also be due to some cause not yet fully understood outside of the craft. The pride in which we are apt to wrap ourselves, upon contemplation of the vast progress everywhere visible over Europe, grows thin upon comparing the effective grouping of colors so exquisite in their individual shades, and the perfection of workmanship upon a fine Cashmere, with the product of our looms; and we wonder how a people whom we consider so low in our scale of civilization, can be so high in the arts which constitute our especial pride.—*London American.*

## Tempering Steel Springs.

When it is required to harden small spiral springs which are made of steel wire, or springs for locks, or any of the other kinds of slight springs, they will require to be uniformly heated to a cherry-red heat, and then immersed in cold oil (not oil which has been long in use and become thick), and entirely quenched. Springs of a medium thickness will be the better for being cooled in water, the water being previously heated to about 60° of heat, and the surface of which should be covered with a film of oil. The thickest kinds of springs will be the better for being cooled in pure water heated to about 70° of heat. Springs require to have the greatest amount of elasticity given to them; consequently, they will, after they are hardened, require to be tempered. They may be tempered separately by smearing them over with oil or tallow and then holding them over a clear fire, or in a hollow fire, or in the inside of a piece of large iron pipe inserted in the midst of the ignited fuel of an open fire, and uniformly heating them until a white flame burns upon them, or, in other words, until the grease burns off with a blaze. If it is a spiral spring (or any other kind of spring which is not thicker at the ends than at the central part) which is being tempered, and which is shorter in its length than the length of the fire, it will be very apt to become heated at the extreme ends first; consequently, as soon as the two ends arrive at the proper temperature (which is known by the grease taking fire) the spring must be immersed in oil: it must not be entirely quenched, but must be taken out of the oil again immediately, and then again exposed to heat. If the oil upon the ends take fire again sooner than the oil upon the middle part of the spring, it must then be immersed again in oil, and then again exposed to heat, and so on until the oil burns uniformly upon all parts; otherwise the spring cannot acquire a uniform temper. After the spring has become uniformly heated to the proper temperature, and the oil burns uniformly upon it, it must then be again immersed in oil, then taken out again immediately and allowed to become cool in the air of its own accord. It will then be fit for use. All kinds of springs, whatever their shape or whatever their size, may be tempered perfectly by this method. It must be borne in mind that there is but one certain temper which gives to steel its greatest amount of elasticity; consequently, the stiffness or pliability of springs must be regulated by the substance and shape of the steel from which they are made. A very convenient way of tempering a large quantity of small springs at once (they must of course, be previously hardened), and of heating them uniformly, no matter how irregular their shape, provided the heat is not too suddenly applied, is to bind a quantity of them together with a piece of iron binding-wire and then to put them into a suitable vessel with as much oil or tallow as will cover them. Then place them over a small clear fire, and slowly heat the whole. Just as the oil begins to boil the springs must be lifted out, when a white flame will burn uniformly upon the whole of them; they must then be immersed in cold oil,—they need not be entirely quenched, but they may be taken out of the oil again immediately and allowed to become cool in the air of their own accord, and when cool, they will be like those which have been blazed off separately over the fire, and fit for use. A separate spring may be attached to a separate piece of wire, which may be lifted out of the oil occasionally, to ascertain when the whole is at the proper heat, which is known by the white color of the flame upon the spring.

Large springs may be tempered by this method, but the time saved with large springs will not be sufficient to compensate for the waste of oil; consequently, it will be more economical to temper the largest springs by blazing over the fire.

It would be well for those who are not accustomed to the operation, before attempting to boil a large quantity of springs, to boil a single one in a small quantity of oil, and so make themselves acquainted with the proper temperature of the oil and the proper temper of the spring.—*Ede on Steel.*

## The Mont Cenis Summit Railroad.

We have already noticed the completion of this great work of engineering, and the success of a trial trip made over the line a few weeks since. An English exchange furnishes us with the following interesting particulars additional to the brief cable announcement we previously published:

"A train, composed of an engine and two carriages, left the St. Michel station at 6:30 A. M., on the 21st of August. The morning was admirably adapted for the trip, the sun shining with great brilliancy upon the Alpine peaks and the numerous glaciers which are visible in different parts of the route.

"After leaving the deep valley in which St. Michel is situated, the line passes by a gradient of one in thirty to the Pont de la Denise, where an iron bridge spans the river Arcq, near the site of that which was carried away by the inundations of last year. As the little train passed the village of Fourneau, the workmen of the Grand Tunnel of the Alps turned out *en masse*, and, as at all other parts of the route, they were observed stooping down, and even endangering their lives for the purpose of inspecting the unusual mechanism of the engine for working on the central rail. The first very steep gradient, of one in twelve, was seen in passing Modane, and, foreshortened to the view, appeared on the approach as if impossible to surmount; but the engine, the second constructed on this system, had already proved equal to the task on the experimental line, and, clutching the central rail between its horizontal wheels it glided quickly up, under a pressure of steam not more than eighty pounds to the square inch, without apparent effort

"The progress was purposely slow, because no engine or carriage had previously passed over the line, and also to give opportunity for examining the works. The damages to the road on which the line was chiefly laid were found to be substantiall repaired by the French government. The magnificent scenery around, and the waterfall near Fort Sessaillon, were much admired, as the sharp curves afforded different views, while passing on the edges of the deep ravines. The train entered Lauslebourg Station under a triumphal arch, having accomplished twenty-four miles of distance, and attained an elevation of two thousand one hundred feet above St. Michel, From this point the zigzags of ascent commence, and the gradients over a distance of four miles were for the most part one in twelve. Looking down from the train near the summit, as if from a balloon, four of the zigzags were visible at the same instant to a depth of two thousand feet. The power of the engine was satisfactorily tested in this ascent, and the summit was reached under salvos of artillery from an improvised battery, and amid the cheers of French and Italians who had gathered to welcome the English on the frontier.

"The engine came to a stand under a triumphal arch, at an elevation of 6,700 feet above the sea. Flags of the three nations, and a silk flag specially presented by Signor Ginaoli to Mr. Fell, waved over a sumptuous breakfast, also provided by that gentleman. The hospice, the lake, and the plateau of the summit, surrounded by snow-clad peaks and glaciers, rising to an elevation of from 10,000 feet to 13,000 feet were passed, and the portion of the descent commenced from the Grand Croix. The railway here follows the old Napoleon Road, which was abandoned long since for diligence traffic on account of the dangers from avalanches. Masonry-covered ways of extraordinary strength had here been speedily provided for the railway. The descent to Susa was a series of the sharpest curves and steepest gradients, on which the central rail had been continuously laid. The valley of the Dora, with Susa and the convent of San Michel, and even the Superga above Turin, visible for thirty miles in the distance, presented a magnificent panorama as the train wound through a clear atmosphere round the mountain side. The confidence of the party was manifested by their crowding round all parts of the engine, and they thoroughly enjoyed the ever changing scenes as they passed round the edges of the precipices Susa was entered amid the acclamations of multitudes of spectators. Thus was completed a journey unexampled in its character, both as respects the steepness of gradients, the elevation of the summit level, and the difficulty with which the curves and precipices were overcome."