SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVII.--No. 3.] [NEW SERIES.] NEW YORK, JULY 20, 1872. [$3 per Annum. [IN ADVANCE.]

MACHINE FOR BUNCHING, WIRING, AND INSERTING BRISTLES IN BRUSH BACKS.

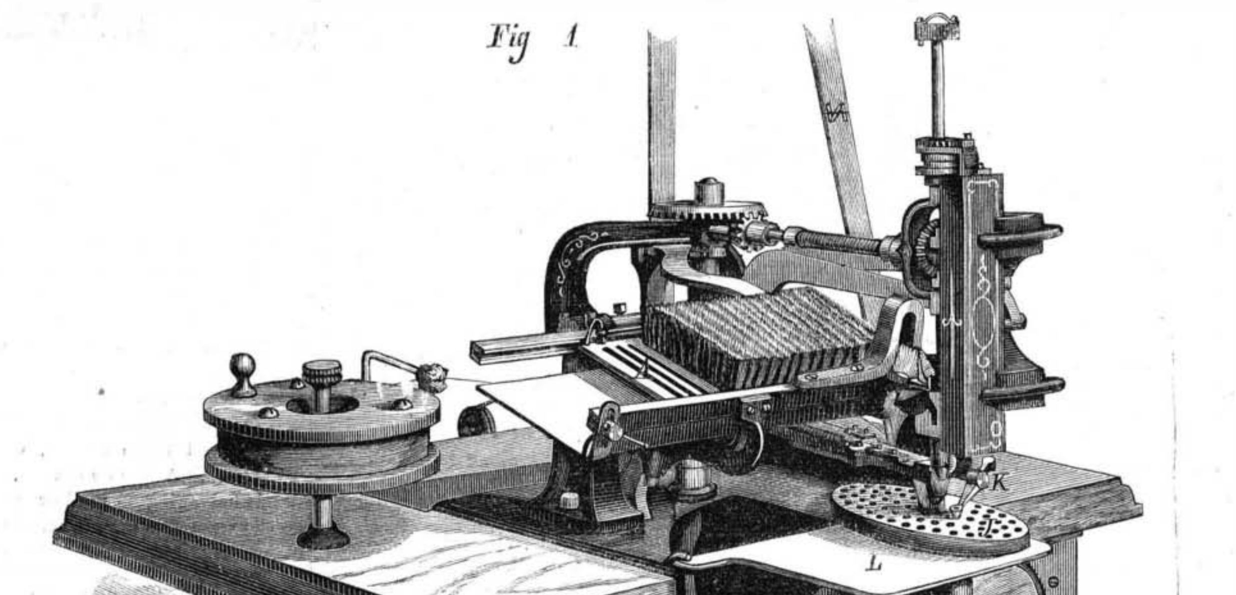
We take pleasure in presenting to our readers engravings and a description of a machine which is so compounded of ingenious devices that it deserves to rank with such *chefs d'œuvres* of inventive skill as the machine for inserting teeth in cloth carding, the Jacquard loom, Blanchard's lathe, etc. To accomplish all that this machine does automatically, most inventors would have used more than one machine. The fertility of mechanical resources brought to bear upon its construction is a remarkable example of the power of combination, characteristic of the highest order of inventive genius.

While we shall endeavor to give the reader a good general idea of the peculiar succession of operations culminating in the final and firm insertion of the bristles in the wood, leather, hard rubber, bone, or ivory backs, we shall be entirely unable to show, in our prescribed limits, the exact means by which each step in order is accomplished. To do this would require a multiplication of diagrams, for which we have not space. Our description will not, therefore, do justice to the mechanical beauty of the machine, which must be seen in operation to be fully appreciated. In witnessing its working, the appreciative mechanic will be ready to share in the enthusiasm which compelled a bystander to ejaculate in our hearing "that machine has a brain!"

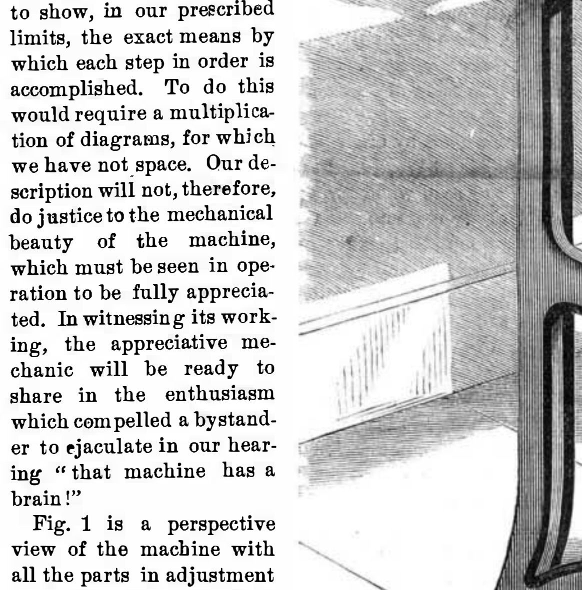
Fig. 1 is a perspective view of the machine with all the parts in adjustment for work, the brush block being in position, and two of the holes having had bristles inserted in them.

The other figures are detailed representations of important parts of the machine, which will be referred to below.

The first operation is the filling of the comb, A, with bristles. This comb is a plate of metal of uniform thickness, slotted so as to leave teeth of equal length and of uniform width throughout their length. The back of the comb being clamped in a suitable vise or holding apparatus, the bristles are drawn in between the teeth of the comb, the pressure of the teeth holding the bristles from dropping out. The bristles are so placed that the teeth hold them as near the middle as the eye can arrange them, so that when the comb is placed in the machine, one half of the length of the bristles appears above the comb, as shown, the other half extending downward.



WOODBURY'S MACHINE FOR INSERTING BRISTLES IN BRUSH BACKS.

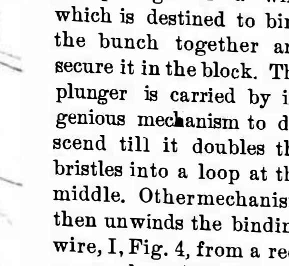


The comb is inserted in guideways, and is actuated by an intermittent traverse motion which, whenever the bristles are all removed from one of the spaces, moves the comb along the distance of one tooth and space to bring another filled space into position. Whenever one comb is emptied, another is made to follow it in the same guideways, the empty one being taken out at the opposite end of the guideways from that in which it was inserted. The operation is then precisely like what would be the case with an endless comb, the teeth of which should be filled in one part of the circuit before reaching the point of discharge.

As the comb is actuated in the manner described, each space is brought successively to correspond with and form a part of a twisted way or channel, B, Fig. 2. An ingenious combination of devices then forces the bristles, as they are wanted, down through this twisted channel, holding them all the time at the middle and bringing them at last into a horizontal position, as shown in Fig. 2.

At the end of the channel, the plate which forms the upper wall is bifurcated, the ends of the bifurcations being turned up as shown. Between these bifurcations, reciprocates vertically a device consisting of a body, C, which tapers off in front to a point, D, and is slotted obliquely and vertically, the oblique portion of the slot being suspended at E, and the vertical portion at F. The lower portion of this piece is a hollow cylinder, the end of which, descending, comes just flush but does not enter the hole in the brush block when the bunch of bristles is to be inserted; one bunch being put in at every descent of this part of the machine; which, from its resemblance to a hook, we shall call by that name as we proceed.

As the hook rises, it forces its point between the proper quantity of bristles for a bunch, and as the bristles cannot ascend they are obliged to move along the inclined portion, E, of the slot in the hook, and so arrive at the bottom of the vertical portion, F. Here they are acted upon by the plunger, G, Figs. 2, 3, and 4. The form of this plunger is shown in Fig. 3. Its end has two slots, crossing each other at right angles when viewed endwise. One of these slots receives the bunch of bristles, as shown in Fig. 3. The other slot (H, Fig. 3) is only of a width to allow the passage of a wire which is destined to bind the bunch together and secure it in the block. The plunger is carried by ingenious mechanism to descend till it doubles the bristles into a loop at the middle. Other mechanism then unwinds the binding wire, I, Fig. 4, from a reel or spool, straightens the wire, passes a proper length through the slightly enlarged upper portion of the slot, H, Fig 3, and cuts off the length of wire required. The plunger then descends further, now receiving as it descends a rotary motion, on its vertical axis, which winds the wire spirally by forcing it into the thread of a nut contained in the lower end of the hollow cylinder, fastening it around the doubled end of the bunch of bristles. This spirally wound wire is destined to be a screw thread for the bunch of bristles as the latter is screwed into the hole in the block, J. Fig. 4. The lower end of the wire acts as a tap, cutting a female screw in the hole of the block, which the spiral of the wire exactly fits. The upper cut end of the wire thread expands and engages with the material of the block, and acting as a pawl, prevents the unscrewing of the bunch, which is thus held with unequaled firmness and strength, so much so that to remove it from



very resisting material will require the block to be split. These operations proceed at the rate of from seventy to eighty bunches per minute.

In order to bring the hole in the block exactly under the cone pointed hollow cylinder extending from the bottom of the hook, a guide, K, is employed which descends upon the block while the bristles are entering one of the holes. A slight movement of the guide by the operator causes the point of the guide to engage the next hole in the series. As soon as the plunger rises, the guide automatically draws the hole it engages to the exact position required to receive the next bunch.

We think the reader will agree with us that a machine, that performs so many distinct movements harmoniously and, at the same time, has nothing flimsy or weak in its construction, is a masterpiece of invention, and one which is doubtless destined to effect a complete revolution in the important industry of brush making. By its use, the difficulty of making the bunches of uniform size and fastening them thoroughly in the block, as well as all other difficulties unsurmounted in other machines hitherto designed to accomplish the same purpose, are entirely overcome. The machine, although including so many movements, is extremely simple and compact, the space being most ingeniously economized. The power required is very small. The table, S, Fig. 1, upon which the block is held, may be inclined at any angle and held by the notched arc, M, so that bristles may be inserted in blocks of any contour or pattern. Patented April 26, 1870, and Dec. 27, 1870. For further information, address Woodbury Brush Machine Co., 30 Cortland street, New York. Concerning European rights, address H. C. Covert, proprietor of the foreign patents, 643 Broadway, New York, or care of H. E. Towle & Co., 20 Budge Row, London.

SMELL.

The *Moniteur Scientifique* contains a paper by M. Papillon on this subject, having reference to recent discoveries in chemistry and physiology. We extract from it the following:

The seat of the sense of smell is, as we know, in the lining membrane of the nostrils. This membrane has a mucous and irregular surface, over which spread a number of nerves with delicate terminations. It secretes a lubricating liquid. By means of muscles, the apparatus of smell is dilated or contracted, like that of sight.

The mechanics of smell are, simply, the contact of odorous particles and the olfactory nerve. These particles are carried by the air into the nostrils. If, on the one hand, the nerve is injured, or even compressed: if, on the other, the air is prevented from passing into the nostrils, there is an absence of smell. The upper part of the nostrils is the most sensitive as regards odor. The sense of smell varies much in different people. Some are entirely without it. Others are quite insensible to certain odors, a case similar to that of Daltonism, in which some eyes fail to perceive certain colors. It is recorded of a certain priest that he perceived no odors but those of smoke and decayed cabbage, and to another person vanilla seemed quite inodorous. Blumenbach speaks of an Englishman who could not perceive the fragrance of mignonette.

Smell is sometimes voluntary, sometimes involuntary. In the former case, to obtain a lively sensation, we close the mouth, and make a long inspiration, or a series of short and jerking ones. The muscles contract the orifices of the nostrils, and thus increase the intensity of the current of air. On the other hand, when we wish not to smell, we exspire through the nose, so as to drive away the odorous air, and inspire by the opened mouth.

Smell and odors are closely connected with the phenomena of taste or gustation. Most savors perceived by us arise from a combination of sensations of smell with those of taste. There are, indeed, only four primitive and radical kinds of taste—acid, sweet, salt, and bitter. This may be shown by experiment. If we close our nostrils on tasting any sapid substance, the perceived taste will come under one or other of these four heads. Thus, when the olfactory membrane is diseased, the savor of food is altered.

How do odorous substances act with reference to the matter which separates them from the organ of smell? Prevost, in 1799, showed that if an odorous body were put in a saucer full of water, the emanations from it agitated the molecules of the water visibly. These motions, of which camphor gives a very good example, have been recently studied by M. Liégeois.

He found that some substances caused movements of gyration and translation over the water surface, similar to those of camphor. Of this class are benzoic acid, succinic acid, and orange bark. In the case of others, this motion ceases very soon, as they become encased in an oily layer over their surface.

He thinks these motions are due, not to a disengagement of gas, causing something like recoil, but to the separation and rapid diffusion of the odorous particles in the water. The fluid shows affinity for these. Similarly, a drop of oil falling on water sends out an infinite number of very small globules, which spread through the liquid, while the volume of the drop is not sensibly diminished. So with aromatic essences. Though insoluble in water, the small odorous particles tend to disperse themselves in it. A small quantity of odorous powder will thus impart perfume to a large body of water.

It is these same odorous molecules which are carried to our nostrils. And the action of water is thought by M. Liégeois to assist in the formation of them. In the morning, when the ground is moist, and the flowers are covered with dew drops, there is a large exhalation of perfume, and similarly after a shower of rain. In gustation, we have something analogous; the saliva is fitted to diffuse the odorant principle; by the motion of the tongue in the cavity of the mouth, this diffusion is promoted, for the surface of evaporation is enlarged. Now, in the same way as the small particles diffuse themselves in water do they diffuse themselves in air, which then becomes the vehicle carrying them to our nostrils.

Some odorous substances have a very great diffusibility. Ambergris, newly cast on the shore, is smelt a long way off. Bertholin states that the odor of rosemary off the Spanish coast is perceptible long before the land comes in sight. The degree of division of the particles is in some cases marvelous. A grain of musk will perfume an apartment for a whole year without sensibly losing weight. Haller mentions having kept for forty years some pieces of paper perfumed with a grain of ambergris, and at the end of that time they still retained their odor.

It is to be noted that the odorous particles are sent out, and the body emitting them does not act as a center of agitation giving rise to vibrations. It is thus a different case from those of light and heat. The odor is the odorous molecule itself; whereas light, as perceived, is not the luminous body.

We cannot tell whether oxygen has some chemical influence on the particles, nor what kind of action takes place on contact of the particle with the nerve, whether a mechanical agitation or a chemical decomposition. But the distinction of the senses into physical (sight, touch, and hearing) and chemical (taste and smell) is a just one. In the latter, contact is always implied.

An able writer has recently tried to prove a kind of music in odors. That is, different odors, according to him, affect the olfactory nerve in various degrees, corresponding to those in which sound affects the auditory nerve. Thus we may have octaves of odors. He enumerates various substances that produce the same impression, but in different degrees; for instance, these four, almond, heliotrope, vanilla, and clematis. By combination he obtains semi odors, corresponding to semitones: forinstance, a rose with a geranium. He points out principles of harmony in perfumes corresponding to those in colors, and thinks it possible to produce a desired perfume from a mixture of others.

The theory is ingenious and worthy of attention, but it is open to grave objections. For the harmony in colors and sounds depends on exact numerical relations, which may be accurately determined; whereas, in the case of smell, the criterion is capricious and uncertain, and it is not possible to reduce to formula what our sense reveals.

There are many cases of hallucination as regards smell, united, generally, with insanity on other points. Lunatics have been met with who constantly complained of a fetid odor; others rejoiced in the most delicious, though imaginary, perfumes. M. Lelut tells of a patient, in the Salpêtrière, who was continually troubled with the smell of dead bodies, which she thought to have been buried in the establishment.

Capellini mentions the case of a lady who could not bear the smell of a rose, and fainted one day when a friend came in with one in her hand. Many other instances could be given. It seems to be well authenticated that in lunatic asylums these delusions as to smell are very frequent.

The intensity and delicacy of the sense of smell vary in different individuals and races. In some it is wonderfully sensitive. Woodwart tells of a woman who predicted storms, several hours in advance, from the sulphurous odor (due to ozone probably) which she perceived in the air. A young American, who was deaf, dumb, and blind, became a good botanist simply by the sense of smell. It is, however, in some of the lower animals that we find the sense most highly developed, ruminants, pachydermous animals, and above all, carnivorous mammifers. Smell is, with some of them, like an eye, which sees objects, not only where they are but where they have been. The keen scent of the dog is well known.

Humboldt mentions that when, in his travels in South America, it was desired to attract condors, all they had to do was to slaughter an ox or a horse, and in a short time the odor attracted a number of these birds, though none were visible previously. Of birds, waders have the largest olfactory nerves, and their sense of smell is most highly developed.

The olfactory organ in reptiles is large. Fishes also have an olfactory membrane, and fishermen have observed that they are driven away when certain odorous substances are thrown into the water. Sharks and other voracious fishes often gather from great distances when a carcass is thrown into the sea. Crustaceans are not insensible to emanations which come in contact with their olfactory fibers.

Entomologists say that the sense of smell in insects is very subtle, but it is difficult to determine the seat of it. When meat is exposed in the air, flies soon appear in great numbers, though none were seen before. The carcases of animals left on the ground attract hosts of insects, which find nourishment in them, and deposit their eggs. This will often happen when the object is concealed, so that their search cannot be guided by sight.

The flower of the cuckoo fruit gives forth a fetid odor, and a number of flies and other insects are often seen moving about on the corolla, in search, it is said, of decayed matter, from which, they imagine, the odor proceeds.

How Long should a Man Stick to his Engine?

A correspondent of the *Locomotive Engineers' Journal*, writing from Rutland, Vt., speaking of the duty and extent of the responsibility of an engine man in case of accident, says:

"Where an accident takes place, such as going down the dump or colliding with another train—a bridge may be gone, a culvert washed away—he may see the fatal leap; I ask you, thinking your experience is worth as much as mine, would there be anything heroic for me to stand on the foot board and plunge with my engine into certain and dreadful death? Is there anything brave about it? Have you no responsibilities here on earth, no matter if you have ten cars loaded with passengers that must follow the engine as the case may be? Now I consider an engineer's responsibility ceases, in such cases, when he has sounded his whistle properly and reversed his engine, opened his throttle, pulled open his sand box. He has done his whole duty to God and man as far as he can to stop the train, and if he has time and opportunity, if he is true to himself, he will try to get off and not go down to the bottom calling for brakes. Many engineers go down and collide and are killed, for the reason they do not have time after doing their duty. I never should feel as if a man was fit to run an engine if he had not courage to do his whole duty. But after he has stood to his post and done all that has been put into his hands to do, then I say he is a man that will try and save his own life."

Two Miles of Track Laid in One Night.

The new Baltimore and Potomac Railway, which Colonel Thomas Scott and the Pennsylvania Central are now building as a rival to the Baltimore and Ohio, a through line between the East and Washington, was completed through to Baltimore last week in a novel and characteristic manner. The opponents of the road, having failed in all other expedients, had determined to get out an injunction to prevent its passage through Baltimore. Their project becoming known to the officers of the company, all hands—some 300—were massed from all along the line, and, as soon as the court adjourned on Monday, work was begun in earnest in constructing the road and laying the track through the city. Night setting in, they were retarded a little; but the moon soon came out, and they went on the same as ever. At twelve o'clock, nearly half the track was completed, and the men, tired and hungry from their excessive labor, pitched into four wagon loads of provisions, that had been brought along, with a fine relish. Work was renewed with vigor, and before nine o'clock in the morning—the time when it was supposed the injunction was to have been made—the last spike had been driven. The distance of the track laid was about two miles, and crossed three streets, Calverton Road, Franklin and Townsend. At the two latter, double tracks were laid. The hands belonging on the lower section of the road embarked on the train for their quarters, and they moved off amid a chorus of yells and screaming of engine whistles.

Improvement in Street Watering.

An official trial lately took place at Hyde Park Corner, Knightsbridge, Eng., of the system for watering streets, public parks, and market gardens, patented by Messrs. Isaac Brown & Co., Edinburgh. The patented apparatus was shown upon the drive at the east end of Rotten Row, Hyde Park, and upon one of the large enclosed flower plots, which has been fitted with it by order of Mr. Ayrton, her Majesty's First Commissioner of Works. In one of the illustrations of the new mode of road watering, one and one half inch lead pipes are laid along close to each kerb stone, these subordinate pipes being supplied from the mains. At intervals of about two feet apart, the pipes are drilled with small holes of from a sixteenth to a thirty second of an inch, in groups of three, each of which is pierced at a different angle. These apertures from the pipes command the complete road, which at the place where they are exhibited is about nineteen yards wide. The water is, of course, supplied under pressure, with a head of about 100 feet, and a shower of a quarter of a mile in length can be commanded with a one and one half inch pipe. The other experiment for road watering was by a central pipe in the middle of the road, which throws its jets towards the kerb stones. The pipes are protected by shields, and provision is made for the surface water being sent past the sides of the pipe to the bottom, where it finds a passage. The central pipe is of course upon the crown of the road, and is protected by an asphalt covering. An apparent objection may be that the small apertures may get choked up by the *débris* of the roads. In practice, however, this is found not to be the case, as the pressure of the water, when it is put on, keeps the drilled holes open. In winter, when there is the danger of freezing, the watering pipes are kept empty, which is not found to be a matter of much practical difficulty.

The Origin of Metalliferous Deposits.

Great deposits of iron ore, says Professor T. Sterry Hunt, generally occur in the shape of beds, although waters holding the compounds of iron in solution have, in some cases, deposited them in fissures or openings in the rocks, forming true veins of ore.

The chemical history of iron is peculiar, since iron requires reducing matters to bring it into solution, and since it may be precipitated alike by oxidation and by farther reduction, provided sulphates are present. The metals copper, lead, and silver, on the contrary, form compounds more or less soluble in water, from which they are not precipitated by oxygen, but only by reducing agents, which may separate them in some cases in a metallic state, but more frequently as sulphides. The solubility of the salts and oxides of these metals in water is such that they are found in many mineral springs, in the waters that flow from certain mines, and in the ocean itself, waters of which have been found to contain copper, silver, and lead. Why then do not these metals accumulate in the sea, as the salts of soda have done during long ages? The direct agency of organic life again comes into play, precisely as in the case of phosphorus, iodine, and potash. Marine plants, which absorb these from the sea water, take up at the same time the metals just named, traces of all of which are found in the ashes of sea weeds. Copper, moreover, is met with in notable quantities in the blood of many marine molluscous animals, to which it may be as ne-