their terrible mauling, evidently all the brighter, smoother and pleasanter for the infliction. The oil of battle still clings to them, however; and, in order to get rid of it, the needles are thoroughly washed in soap-suds in a copper pan swinging upon a pivot, and then dried in sawdust.

They are now all at sixes and sevens, and have to be "evened," or placed in a parallel direction. This is accomplished by placing them in little trays. Heads and points still lie together; and in order to put them all in the same direction, the "ragger" is employed. The girl who performs this office places a rag or dolly upon the forefinger of her right hand, and, with the left, presses the needles against it; the points stick into the soft cotton, and are thus easily withdrawn and laid in the right direction. Little children "rag" with inconceivable rapidity, and with equal speed the process of sorting, according to lengths, is performed; the human hand appreciating even the sixteenth of an inch in length, and separating the different sizes with a kind of instinct with which the reasoning power seems to have nothing to do. The needles are now separated into parcels, and such is their uniformity that, like sovereigns, weighing takes the place of counting—1,000 needles in one scale exactly balancing 1,000 in another. The needles, being now placed in companies, are in future manœuvred together; that is, the heads of each company are simultaneously subjected to heat in order to soften them, for the double purpose of giving a blue to the gutters (which is considered an ornament), and of counter-sinking the eyes, in order that they may not cut the cotton. The final processes of grinding the heads and points, and polishing, is now performed by skilled workmen. The needles, in companies of 70 each, are subjected to a small grindstone, the workmen slowly revolving the whole number, so that they are ground in a mass, as it were, and the polishing being accomplished in a like manner on a similar wheel smeared with crocus. The original batch of wire, of 14 lbs. weight, gives material for 48,100 needles; and, after having undergone every process, it is found that they number, on the average, 46,700; so that the loss by breakage has only been 1,400. Even with this comparatively small waste, however, the accumulation of imperfect needles in course of time is immense. We saw heaps of many tuns weight in the premises of one of the large manufacturers. It is roughly calculated that upwards of 10 tuns of wire are weekly employed in the manufacture of needles in Redditch and the adjoining villages. If we multiply this by 52, we get the enormous weight of 520 tuns of needles turned out annually from this neighborhood alone. This mass, representing a number of needles which we feel unequal to calculate, goes to keep company, we suppose, with the pins, the mysterious manner of whose final disappearance has never yet been properly accounted for.

A. W.

CURRYING LEATHER.—Although currying is very nearly connected with tanning, being merely a continuation of the operations necessary to prepare the leather for use, it is very generally exercised as a separate branch of business. It applies chiefly to the stronger kinds of leather, such as ox-hides, technically called *butts*, or *backs;* cow-hides, which are lighter, and to which the term *hides* is appropriated by the tanner; and *skins*, the term apart for leather made of the skins of calves, seals, dogs, and similar animals. By the currier, the tanned skins are softened by soaking in water. The wet skin is then thrown upon a beam with the flesh side outermost, and the leather is reduced to a uniform thickness by means of a double-edged knife of a peculiar construction, which is applied horizontally. It is afterwards thrown into water to be scoured and extended; and for this purpose it is laid on a stone table and worked well with the edge of a small square stone fixed in a handle, and cleared with a brush from a whitish substance which appears in all leather tanned with bark. The hide being then removed to the drying shed, there is applied to it a mixture of oil and tallow, and it is dried either under the shed or by a stove. The next operation is called boarding or bruising. The skin is doubled and worked with a coarse grooved board till it is well softened, and is again lightly shaved, which leaves the flesh side clean, and after the second boarding it is said to be "finished russet." The blacking is usually performed by the currier.—*Book of Trades.*

IMPORTANT HINTS ON VENTILATION

BY E. M. RICHARDS, C.E.

[Written expressly for the Scientific American.]

[Continued from page 378.]

The correct method of proceeding with regard to the ventilation of an ordinary dwelling-house is as follows:—When building, have an opening made in the middle of the ceiling of each room; from these openings let conduits or pipes be laid alongside the joists, in the space between the ceiling of the lower room and the floor of the room above. These pipes are to lead into a main shaft constructed in the chimney like an ordinary flue, except that it does not open into the atmosphere at the top, but is conducted down to some fire-place that will be constantly in use—the kitchen one for instance. It would be very easy to so construct the cooking range that the mouth of this shaft could discharge directly under the grate bars, and to cause the fire to draw its supply of air through it, and consequently suck the foul gases of all kinds out of the various chambers with which this conduit connects. This continual withdrawal of the noxious air from the apartments is more necessary where coal gas is the lighting material. There is generally more or less escape of this unburnt; and it adds much to the unwholesomeness of rooms. Flat ceilings are not so well adapted to the purposes of ventilation as those that are concave; sunken panels are especially to be avoided, as they offer mechanical obstructions to the free escape of the polluted current, and may cause it to descend to the lower parts of the rooms, instead of freely entering the "upcast" pipe. If a cooking-stove be used instead of a range, a slight modification will be necessary; the main shaft must then discharge, with an upward draft, into (perhaps) the same flue that the stove does, which flue, being warmed by the passage of the smoke, &c., will help to draw the air from the various rooms connected with it; so that, in either case, the poisonous products of respiration, animal effluvia, unburnt gas, &c., are removed, as fast as formed, by a constant upward current, in accordance with their natural ascending power.

The method of heating by means of hot air gives a circulation to the atmosphere of the rooms, but it is not a healthy system—the air supplied to the lungs is too hot and dry. Our climate is already too stimulating, and it is much to be feared that the general introduction of "heaters" will add to the prevalence of that fatal disease, consumption. For ordinary dwelling-houses, well regulated stoves or open fire-places, in conjunction with correct ventilation, are far preferable. For large public buildings, heated pipes supplied by steam or hot water are probably better; but, at all events, save us from hot *air!*

It is more necessary to construct some special apparatus for the removal of foul air than to provide for the entrance of pure, for the latter will generally find its way in if the former be promptly got rid of; and at any rate, a slight opening of the lower window-sash will supply the requisite amount; though of course, to complete the affair as it should be done, there ought to be at least one ample fresh air inlet for each room, independent of the windows. If the chamber be warmed by an open fire-place there ought to be an "incast" on each side of the grate, a little distance from it, situated in the wall, about 1½ feet from the floor. The mouths of these incasts should be covered with fine gauze to spread the in-coming draft and prevent an unpleasant stream pouring upon any one. If admitted (as is sometime recommended) by multitudes of small holes through the floor, it both raises dust and gives cold feet as it ascends; if, on the other hand, the points of entrance are situated at a greater elevation than the mouth of a seated or recumbent individual (as is generally the case in railroad cars, whenever any attempt at all is made at ventilation), the entering fresh air, in its descent, encounters the escaping foul air rising towards the upcast; the latter, being cooled by the contact, loses its force of ascent, and becomes partially mixed with the pure element, which, in this deteriorated condition, is breathed by the inmates of the room. This would of course be a great evil, and would defeat, to a codsiderable extent, the purpose for which ventilation was intended; so the correct rule is, to make the fresh current enter the chamber at some point between the floor and the mouth of a person lying on a sofa or bed. If the incasts are made in the wall opposite the fire-place, they will cause a draft of cold air (in winter) to come upon the backs of those sitting round it. These remarks refer only to that kind of ventilation in which the air is admitted at the temperature of the external atmosphere; it would, of course, be perfectly possible to warm it to any desired degree before introducing it, but this is more requisite for large public halls than private houses, where only a limited number of persons supply the rooms. The incasts and upcasts should all be furnished with valves to regulate their size according to the state of the weather, or to throw them out of connection with the conduits altogether when desired.

Care should be taken to draw the supply of fresh air from as pure a locality as possible. It would probably be better to have only one or two external apertures to the incast main pipe, and to have service branches proceeding from it to the different rooms, as in the case of the foul air vents. The incast should be protected at its entrance into the air, so that no vermin could get into it; and the various parts of the apparatus ought to be made as approachable as possible, to facilitate repairs when needed. In case it is impossible to adopt the plan here detailed, the atmosphere of a room may be very much improved by removing a brick out of the chimney, close to the ceiling (in the case of an open fire-place being used), so as to form a communication with the flue; and a tin or sheet-iron damper may be fixed to close it when desirable. If a stove be the means for warming the apartment, it is advisable to have the stove-pipe made considerably too small to fill the aperture in the chimney, because this leaves a space around the former. The heat will cause an in-draft from the room to the flue, and if, at the same time, the window be kept more or less open, a small family of *non-smokers* can inhabit the chamber without injury. Paper should never be pasted over the stove-pipe hole in summer. In the case of large public buildings, a furnace is often kept going, to exhaust the air from the various halls, &c., or a number of gas-burners are used for the same purpose. The latter plan has some advantages, as they can be applied at the top of the building and save the return shaft necessary in the other case. The admission of the pure air is managed on the general plan indicated, but it might be slightly warmed (but not *heated*) for winter and cooled by passing over ice in summer. In this larger application of the principles of ventilation, each particular case must be treated according to the circumstances attending it. The ventilation of private houses is more important, inasmuch as we pass more of our time in them, at night especially, and in them, mainly, are the constitutions of our children formed.

If some such method as that which I have sketched was in general use, it would be an untold advantage to the nation at large; sedentary pursuits would be deprived of three-fourths of their injurious tendency. If persons, whose vocations forbid their passing much of their time out of doors, could only be furnished with an abundant supply of good breathing material while at their business, they would suffer comparatively little from the want of exercise; for, by a well regulated system of gymnastics, after business hours were over, they could keep their limbs and digestive organs in fair order.

The size of the foul and pure apertures must depend on the number of persons who are to inhabit the room, the number of lights burned and the velocity of the currents. The amount of air rendered unfit for respiration by a full grown man per minute, is variously stated at from 2 to 10 cubic feet. Let us suppose 7 cubic feet to be the correct quantity: now, if there is an apartment 20 feet long by 15 feet wide and 10 feet high, containing 3,000 cubic feet, and inhabited by 8 persons, those persons will render the whole air unfit for breathing in about 54 minutes, so that the 3,000 cubic feet of air must pass out of the foul vent every 54 minutes; to do this, with a velocity of about 365 feet per minute, an opening of about 5 inches square will be required. It must be remembered that the incasts should have a larger area than the upcasts, as the former have to supply oxygen to the fire as well as to the lungs of the inmates. The above calculation is only intended to show the amount required by the lungs. Where air-tight stoves are used, as in the northern States, the necessity for ventilation becomes more imperative; but the large open fire-places of the South somewhat mitigate the evils to which I have referred.

[To be continued.]