



## II. On the method of distilling as practised by the natives at Chatra in Ramgur, and other parts of India

Archibald Keir Esq.

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tricity appears also when the body is in a state of perspiration. There are persons who, in this manner, never emit electricity. The electricity which shews itself in the human body is positive, and sometimes negative. The cause of this variation he was not able to discover.

[To be concluded in next Number.]

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II. *On the Method of Distilling as practised by the Natives at Chatra in Ramgur, and other Parts of India.* By ARCHIBALD KEIR, Esq.\*

THE body of the still they use is a common, large, unglazed, earthen water-jar, nearly globular, of about twenty-five inches diameter at the widest part of it, and twenty-two inches deep to the neck, which neck rises two inches more, and is eleven inches wide in the opening. Such, at least, was the size of the one I measured; which they filled about a half with fomented Mâhwah flowers, that swam in the liquor to be distilled.

The jar they placed in a furnace, not the most artificial, though seemingly not ill adapted to give a great heat with but very little fuel. This they made by digging a round hole in the ground, about twenty inches wide, and full three feet deep; cutting an opening in the front, sloping down to the bottom, on the sides perpendicular, of about nine inches wide and fifteen long, reckoning from the circle where the jar was to come, to serve to throw in the wood at, and for a passage to the air. On the side too they cut another small opening of about four inches by three; the jar, when placed, forming one side of it, to serve as a chimney for the smoke to go out at. The bottom of the earth was rounded up like a cup. Having then placed the jar in this, as far as it would go down, they covered it above, all round, with clay, except at the two openings, till within about a fifth of its height; when their furnace was completed.

In this way I reckon there was a full third of the surface

\* From the *Asiatic Researches*.

of the body of the still, or jar, exposed to the flame, when the fire came to be lighted; and its bottom, not reaching to within two feet of where the fuel was, left a capacious hollow between them, whence the wood, that was short and dry, when lighted, being mostly converted into flame, and circulating on so great a surface of the still, gave a much stronger heat than could else have been produced from so very little fuel: a consideration well worth the attention of a manufacturer, in our country more especially, where firing is so dear. There indeed, and particularly as coal is used, it would be better, no doubt, to have a grate; and that the air should enter from below. As to the benefit resulting from the body of the still being of earthen-ware, I am not quite so clear in it: Yet, as lighter substances are well known to transmit heat more gradually and slowly than the more solid, such as metals, may not earthen vessels, on this account, be less apt to burn their contents, so as to communicate an empyreumatic taste and smell to the liquor that is distilled, so often, and so justly complained of with us? At any rate, in this country, where pots are made so cheap, I should think them greatly preferable, as at least much less expensive than those which the gentlemen engaged in this manufacture most commonly employ: though of this they are best able to judge.

Having thus made their furnace, and placed the body of the still in it, as above described, they then luted on, with moistened clay, to its neck, at the opening, what they here call an *adkur*; forming with it, at once, a cover for the body of the still, with a suitable perforation in it to let the vapour rise through, and the under-part of the alembick. The *adkur* was made with two earthen pans, having round holes in their middles of about four inches diameter; and, their bottoms being turned opposite the one to the other, they were cemented together with clay; forming a neck of junction thus of about three inches, with the small rising on the upper pan. The lowermost of these was more shallow, an about eleven inches wide, so as to cover exactly the opening at the neck of the jar, to which they luted it on with clay. The upper and opposite of these was about four inches deep,

and fourteen inches wide, with a ledge round its perforation in the middle, rising, as is already said, from the inner side of the neck, of about half an inch high, by which a gutter was formed to collect the condensed spirit as it fell down; and from this there was a hole in the pan to let it run off by; to which hole they occasionally luted on a small hollow bamboo, of about two feet and a half in length, to convey it to the receiver below. The upper pan had also another hole in it, of about an inch square, at near a quarter of its circumference from the one below just spoken of, that served to let off the water employed in cooling; as shall be mentioned presently.

Their *adkur* being thus fitted to the jar, they completed the alembic by taking a copper pot, such as we use in our kitchens, of about five inches deep, eight wide at the mouth, and ten at the bottom, which was rather flattish; and turning its mouth downward, over the opening in the *adkur*, luted it down on the inside of the jar with clay.

For their cooler they raised a feat, close upon, and at the back part of the furnace, about a foot higher than the bottom of the copper pot. On this they placed a two or three gallon pot, with a round hole, of about half an inch, in the side of it; and to this hole, before they lighted their fire, they luted on a short tube of a like bore; placing the pot, and directing its spout, so as that, when filled with water, it threw a constant and uniform stream of it from about a foot high, or near the centre of the bottom of the copper pot, where it was diffused, pretty completely, over its whole surface; and the water falling down into the upper part of the pan of the *adkur*, it thence was conveyed, through the square hole already mentioned, by a trough luted on to it for that purpose, to a cooling receiver a few feet from the furnace; from which they took it up again, to supply the upper pot as occasion required.

As their flock of water, however, in this sort of circulation, was much smaller than it seemingly ought to have been, being scarcely more than six or eight gallons, it too soon became hot; yet, in spite of this disadvantage, that so easily might have been remedied, and the shortness of the conducting tube, which had nothing but the common air to

cool it, there ran a stream of liquor from the still, and but very little vapour rising from it, beyond any thing I had ever seen from stills of a much larger size, fitted with a worm and cooler. In about three hours time, indeed, from their lighting of the fire, they drew off full fifteen bottles of spirit; which is more by a great deal, I believe, than could have been done in our way from a still of twice the dimensions.

The conveniences of a worm and cooler, which are no small expence either, I have myself often experienced; and if these could be avoided in so simple a way that might easily be improved, the hints that are here offered may be of some use. The thin metal head is certainly well adapted, I think, to transmit the heat to the water, which is constantly renewed; and which, if cold, as it ought to be, must absorb the fastest possible: whereas, in our way, the water being confined in a tub, that, from the nature of its porous substance, in a great degree, rather retains than lets the heats pass away, it soon accumulates in it, and becomes very hot; and, though renewed pretty often, never answers the purpose of cooling the vapour in the worm so expeditiously and effectually as is done by their more simple and less expensive apparatus. In this country, more especially, where labour and earthen-wares are so cheap, for as many rupees, and less, twenty furnaces, with stills, and every thing belonging to them, independent of the copper pots, might very well be erected, that would yield above a hundred gallons of spirits a-day; allowing each still to be worked only twice. So very cheap indeed is arrack here, to the great comfort of my miners, and of many thoughtless people beside, that for one single *peysa* (not two farthings sterling) they can get a whole *cutcha-fer* of it in the *bazar*, or above a full English pint, and enough to make them completely intoxicated; objects often painful to be seen.

Of the superior excellence of metal in giving out heat from itself, and from vapour contained in it, we have a very clear proof in what is daily performed on the cylinder of the steam-engine: for, cold water being thrown on it when loaded, the contained vapour is constantly condensed; whence, on a vacuum being thus formed, and the weight of the atmosphere

sphere acting on the surface of the piston attached to the arm of the balance, it is made to descend, and to raise the other arm that is fixed to the pump; while this, being somewhat heavier, immediately sinks again, which carries up the piston, while the cylinder is again filled; and thus, by alternately cooling and filling it, is the machine kept in motion; the power exerted in raising the pump-arm being always in proportion to the diameter of the cylinder, or to the surface of the piston, which is exactly fitted to it, and on which the pressure acts.

The contrivance, too, of having the under part of the alembic, where the condensed vapour is collected, or upper part of what they call the *adkur*, of earthen-ware, of so great a thickness, and of course at so great a distance from the heat in the body of the still, is well imagined to keep the spirits the coolest possible, when collected, and running off.

By thus cooling and condensing the vapour, likewise, so suddenly as it rises, there is, in a great measure, a constant vacuum made, or as much as possible can be; but, that both steam rises faster, and that water boils with much less heat when the pressure is taken away from its surface, is an axiom in chemistry too well known to need any illustration; it boiling in vacuum when the heat is only ninety or ninety-five by Fahrenheit's thermometer; whereas in the open air, under the pressure of the atmosphere, it requires no less than that of two hundred and twelve, ere it can be brought to the boiling point.

I must further observe, that the superior excellence of condensing the vapour so effectually and speedily in the alembic to our method of doing it in a worm and cooler, is greatly on the side of the former; both from the reasons I have already adduced, and because of the small stream of vapour that can be only forced into the worm, where it is condensed gradually as it descends; but, above all, from the nature of vapour itself, with respect to the heat contained in it, which of late has been proved, by the very ingenious Doctor Black, to be greater by far than, before his discoveries, was imagined. For vapour he has shewn to be in the state of a new fluid, where water is dissolved by heat; with the assistance,

perhaps, if I may be allowed a conjecture, of the air which it contains; and all fluids, as he has clearly demonstrated, on their becoming such, absorb a certain quantity of heat, which becomes what he very properly calls latent heat; it being heat not appearing either to the senses or to the thermometer while they remain in that liquid state, but showing itself immediately by its effects on whatever is near it; upon their changing their form from fluid to solid, as on water becoming ice, or metals fixing, and the like. In the solution of salts, also, there is an absorption of heat, as we daily experience in the cooling of our liquors by dissolving salt-petre in water; and this he has found to be the case with water itself, and other fluids, when passing into a state of vapour by boiling. From the most accurate and judicious experiments, indeed, he infers, and with the greatest appearance of truth, that the heat thus concealed in vapour raised by boiling, from any given bulk of water, would be fully sufficient, if collected in a piece of iron of the like size, to make it perfectly red hot. What then must be the effect of so much heat communicated in our way of distilling to the worm, and to the water in the tub, will be sufficiently evident, from what has been said, to prove, I think, that we have hitherto employed a worse and more defective method than we might have done with respect to cooling at least, both in the making of spirits, and in other distillations of the like kind, where a similar mode is adopted.

The poor ignorant Indian, indeed, while he with wonder surveys the vast apparatus of European distillers, in their immense large stills, worms, tubs, and expensive furnaces, and finds that spirits thus made by them are more valued, and sell much dearer than his own, may very naturally conclude, and will have his competitors join with him in opinion, that this must alone surely be owing to their better and more judicious manner of distilling with all those ingenious and expensive contrivances, which he can no ways emulate: but in this, it would appear, they are both equally mistaken; imputing the effects, which need not be controverted, perhaps, to a cause from which they by no means proceed; the superiority of their spirits not at all arising from the

the superior excellence of these stills and furnaces, nor from their better mode of conducting the distillation in any respect; but chiefly rather from their greater skill and care in the right choice and proper management of the materials they employ in fermentation; and, above all, as I apprehend, from the vast convenience they have in casks, by which, and from their abilities in point of stock, they are enabled, and do in fact, in general, keep their spirits for a certain time, whence they are mellowed, and improved surprisingly both in taste and salubrity.

All I need further add with respect to distillation, and on the superior advantages in the mode of conducting it here, to that we have been in use to employ, for the raising of spirits, simple waters, and the like, is only to observe, I have no sort of doubt but that the intelligent chemical operators at home, if ever they should get a hint of it, will make no manner of scruple to use it also, and to improve upon it greatly by a few ingenious contrivances, which their knowledge and experience will so easily suggest. The principles on which it seems founded, indeed, especially with regard to their way of cooling, are so striking and just, that in many other distillations besides those of spirits and waters, they may be employed, I apprehend, with very great profit and advantage. I shall now, however, confine myself to mention only the benefit that may result from a like process in the raising of the finer aromatics, while the heat contrived, as in our way, besides impeding the distillation, must, from its long action on such subtle bodies, probably injure them greatly in the essential quality on which their excellence depends; and upon this very account I am apt to imagine that the greater quantity obtained, and the superior quality of the oil of roses made in this country, to that made from roses with us, is owing chiefly, if not entirely, to their better and more judicious manner of extracting it here. For with us, the still, being made of metal, may, in the first instance, impart too great and too sudden a degree of heat; and next, the oil continuing so long in the vapour, and that much compressed, may, in so delicate a subject, not only entirely almost unite it with the water so as to render the separation



tion impracticable, but may at the same time alter its essence so completely, as that it can no longer appear in the state it otherwise might have been found in, had the operation been better conducted, or in the way they do here. A very few trials, however, would much better certify this than all I can possibly say on the subject, or, in fact, than all the reasoning in the world. Therefore, as to my own particular opinion of the flavour and quality of the roses at home being equal, if not superior, to that of those in this country, I may be entirely silent; the rules and reasoning in chemistry, though serving greatly to enlarge and improve our understanding, being what of themselves can never be depended upon till confirmed by facts and experiments; where many things often turn out very different from what, from our best and most plausible arguments, we had the greatest reason to expect. Or, if it should be found to be really true, what I have often heard asserted, by those however who had it only from others, but not of their own particular knowledge, that, in distilling their oil of roses at the places where they make it the best, they use also with their roses, sandal wood, and some other aromatics, no roses whatsoever, it is plain, could ever of themselves be made to afford a like oil, nor without such an addition as they employ. A circumstance, by the bye, that might possibly easily be certified by some one of the many ingenious correspondents of the Society who may happen to reside where it is made; and a knowledge of the real truth of it would certainly be of use.

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III. *On the Method employed at Fez and Tetuan to prepare those Goat Skins called Morocco.* By C. A. BROUSSENET\*.

THE skins, after being flayed from the animals by stripping them off entire, are immersed in water for three days: they are then exposed to the air, and, when dry, the hair is taken off, but imperfectly. They are then dipped in slacked lime, and sprinkled over with powdered lime to detach the

\* From the *Bulletin des Sciences*, No. 23.