

THE WINNOWING OF TEA*

D. W. FINLEY, B.A., B.Sc.(Oxon.) A.M. Inst., B.E.

There are two principal methods by which extraneous matter may be extracted from tea. These are:—

- (1). A sifter superimposed on a packer, and fitted with a hopper and an electromagnet.
- (2). A blower or winnower.

The latter is already installed in many factories, but its use has often presented difficulties, and its scope has not been fully exploited.

There are a number of simple and obvious rules which are enforced in the majority of factories to minimise the risk of any contamination of the tea:—

- (1). Careful cleaning of leaf lorries, and if necessary the brushing of sacks.
- (2). The cleaning and sweeping of stairs and lofts, after the arrival of field coolies with leaf.
- (3). Foot-mats for use of coolies entering the factory.
- (4). At least one cooly in the rolling room to pick over the bulk, and another in the firing room to pick over the big bulk after firing.
- (5). The use of strips of hessian in the firing room.
- (6). Prohibition of worn out baskets, ekel brooms, or boxes.
- (7). Strict rule that every tea chest before being used for packing must be turned upside down and inspected.

A commercial extractor which has recently been tried in Ceylon, has a No. 4 galvanised iron wire-mesh placed in a hopper over a powerful electromagnet, the whole being arranged to feed into a tea chest over the usual packer, in conjunction with which it

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operates. It is capable of extracting all large pieces of foreign matter, and all magnetic matter, but cannot deal with small material of a non-magnetic nature. Against this method is claimed the following disadvantages:—

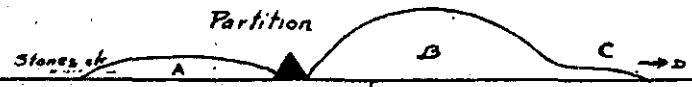
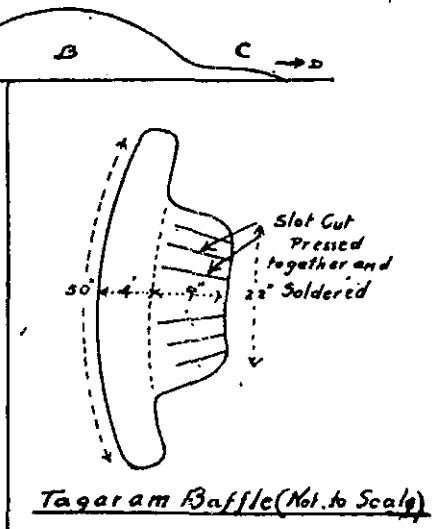
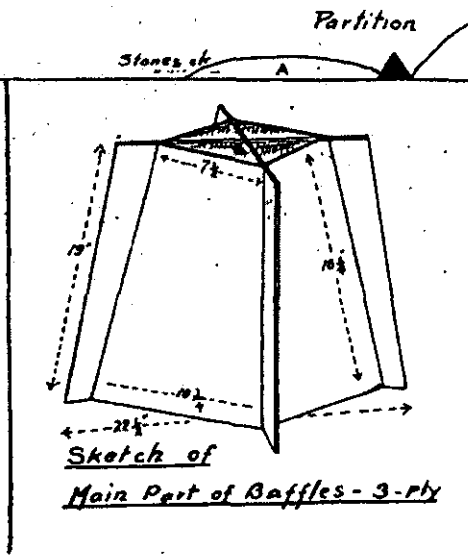
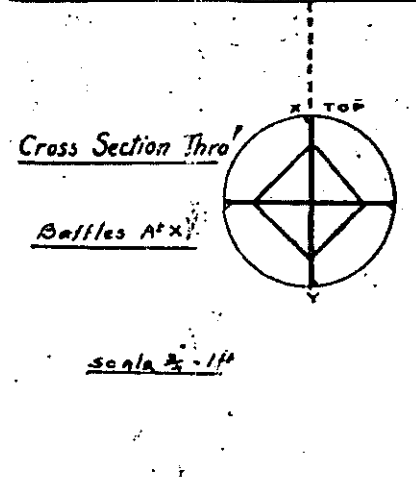
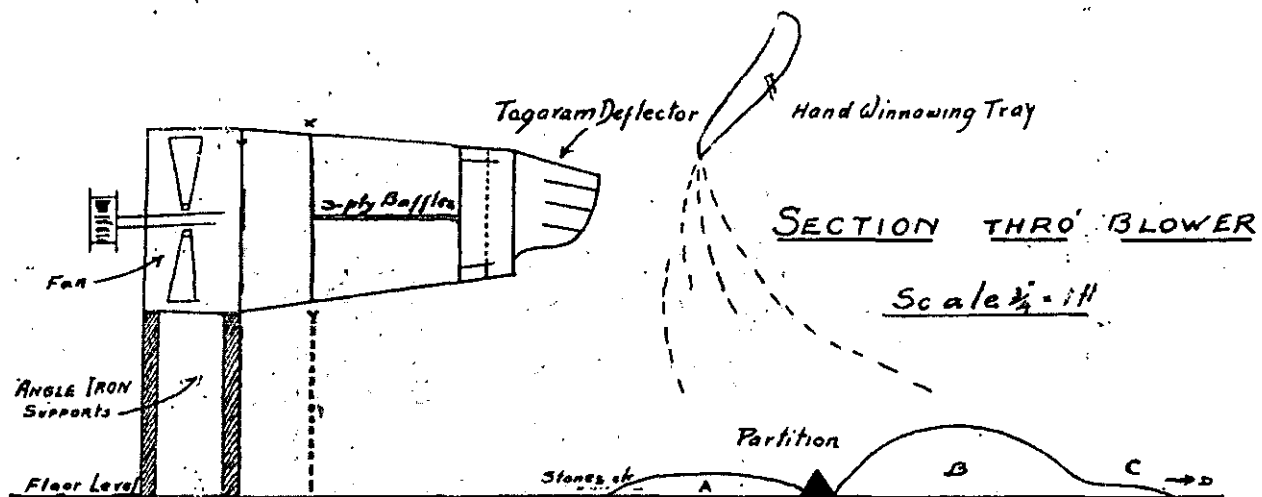
- (a). The galvanised sieve is apt to grey the tea.
- (b). It is slow, and delays packing.

From these experiments the latter appears to be the most serious difficulty.

Many factories have some sort of small blower already installed and this can be used for cleaning the tea. Many superintendents have not been able to make full use of it because, as fitted up by the manufacturers, it is not even capable of removing red leaf and flaky tea from bold pekoes. In the blower on which these experiments were made, the air was delivered as though it were blowing over the *surface* of a cone from the apex, with a solid angle of at least 75° . To be of use it must come in a steady stream in the shape of a truncated cone of gradually widening angle. There must be no air pockets. Baffles were inserted to rectify the faults of the blower. The position of these baffles can be calculated, and no doubt will vary for every blower. The baffles were inserted with these objects in view:—

- (1). The air must come in a smooth even blast, and have no pockets or eddies.
- (2). This blast must hit the ground some 15 feet from the mouth of the blower, in order to carry away the flaky and red leaf.
- (3). The blower must also be capable of delivering a much slower stream of air on the circumference of the main blast, so as to remove any flaky leaf blown laterally.
- (4). The volume of air must be adjustable.

The blower used was a C.C.C. winnower fitted with a 24-inch fan doing 600 r.p.m., and delivering through a 3-foot long funnel (which converged to a circular orifice 16 inches in diameter) a maximum of just over 2,000 cubic feet of air per minute. The price of this machine is Rs. 190 f.o.r. Colombo.



The requirements outlined above were achieved by the system of baffles illustrated in the diagrams. It is very difficult to describe these, although they are really quite simple. The conical delivery jet of the blower was divided through about 18 inches of its length into four quadrants. At 45° to each quadrant, is fitted a baffle in the shape of a truncated isosceles triangle. These baffles were made of 3-ply board, bound together by tea chest binders, and strengthened by wooden battens rivetted to the edges. The whole structure resembles a rectangular pyramid divided diagonally — the diagonals extending beyond the edge of the pyramid — and the whole truncated.

The next problem was to direct the air so as to hit the ground at a suitable distance from the blower. By means of packing under the foundation bolts, the blower was inclined to the horizontal. The pulley had to be fitted with $\frac{1}{2}$ -in. flanges, and moved to the extremity of the fan shaft, to prevent the belt jumping off. In order to depress the direction of the air still further, a ring-shaped baffle was cut in tagaram and fitted to the wooden baffles. Another deflector, of considerable utility, was placed over the upper part of the mouth of the blower, and deflected at a steeper angle than the blower itself. The shape of the tagaram is shown in the diagram. The metal when curved exactly fits the mouth of the blower, and the slots may be forced together and soldered.

The only remaining difficulty was the production of a current of air of varying intensity according to the grade of tea being blown. This was readily achieved by the fitting of adjustable doors over the intake of the fan. The whole of the work of fitting these baffles can be undertaken by an intelligent engine-driver mechanic. The materials, even if new, would only cost about Rs. 5.

EXPERIMENTAL

A series of experiments was carried out to compare the relative efficiency of a sieve and a blower. Sifters are thought to grey tea. Blowers are supposed to remove the fine hairs from the surface of the tea, and so reduce the liquors. In order to exaggerate these effects and to make them measurable, experiments were carried out on two lots of 15 lbs. of pekoe, one lot being put over the sifter

30 times, and the other being put over the blower 10 times. The sieve was shaken by hand, a treatment much less severe than used in the commercial 'extraction' method. The pekoe was first of all sifted over a No. 14 hand bamboo sieve to remove dust and small tea before the samples were weighed up. At the end of the experiments the resultant tea was re-sifted over the same hand sieve.

A. SIEVE

A 2 x 3-foot wooden framed galvanised iron sieve of No. 6 mesh was used. This would let through almost all the sample of pekoe. 15 lbs. passed through the sieve in 95 secs. with 270 hand movements. After sifting in this way 31 times, the sample was divided into two dhools by means of a No. 14 hand sieve. The weights were:—

Weight of sizeable pekoe ...	13 lbs. 0 oz.
Weight of smalls ...	2 lbs. 0 oz.

Hence on the average, 0.44 per cent of fannings and dust were formed each time of sifting, in spite of the mild method of vibration employed. The strength and colour of the liquors after this treatment, from bulked samples, were indistinguishable from the original sample. The tea appeared to be a little greyed, but by no means as much as might be expected.

B. WINNOWER

15 lbs. of pekoe were blown out, mixed, and re-blown 10 times. The following dhools were obtained:—

Good Pekoe tea ...	14 lbs. 6 oz.
Flaky Pekoe ...	— 6 oz.
Dust and smalls ...	— 4 oz.

Loss in weight due to blown out fluff not detectable

In this case, 0.17 per cent dust and fannings were formed each time of blowing. The liquors of the final bulked samples were indistinguishable from the original. But the liquors of the good pekoe tea were better, presumably due to the removal of a little flaky leaf.

C. CONCLUSION

The fannings and dust when removed from either sample gave a very much stronger liquor. Clearly, therefore, a loss of liquor must result if this were removed from the sample. In the case of the experiment with the blower, the smalls were formed through the collection of the tea from a concrete floor. Hence (by subtraction) the sifting of tea over a No. 6 mesh as described results in the formation of $(0.44 - 0.17)$ per cent = 0.27 per cent of smalls. To the exponents of clean grades, even this small percentage of smalls in, for example, a pekoe tea is undesirable. In addition to this, it is not unreasonable to suppose that the more rapid movements of the sieve attached to the mechanical extractor would do more damage to the tea, besides making it harder for the tea to go through into the chest underneath.

The fan winnower showed no signs of greying the tea.

EXTRACTION OF EXTRANEIOUS MATTER

The normal commercial extractor can only extract, besides the magnetic material, non-magnetic material incapable of passing through the No. 4 mesh generally employed. The blower is capable of extracting stones so small that they have passed through the No. 16 mesh, and appeared in the fannings grades of tea. It is not possible to do this with the commercial extractor. Larger fragments are removed with unfailing regularity by either the winnower or the commercial extractor. By suitably inclining the blower, it was possible to extract pieces of hessian, etc., even if this fell on the tea in the first place. The inclined current of air would then blow it away. All grades of tea were treated with equal ease, by means of the winnower, with the exception of dust. From all grades, whether it was orange pekoes or broken orange pekoe fannings, red leaf and flaky leaf were extracted with equal ease. In extracting small stones from the smaller grades it was necessary to be able to control the volume of air.

ROUTINE

One intelligent cooly woman rapidly developed a simple technique, which was at the same time both speedy and effective. In about two hours two coolies can deal with some 1,500 lbs of made tea.

The most efficient way of using the blower can be represented diagrammatically. The winnowing basket must be held as shown*, not too high, nor too far away from the mouth of the blower. The advantage of holding it like this is that any stones fall towards the blower, and consequently do not bounce into the tea. By this means a remarkable number of small stones can be extracted even from the sifted fannings, more particularly on wet days.

The tea **A** was re-blown. The second blowing left a few pounds out of about 100 lbs. containing all the stones and any other extraneous matter of a heavy nature. Careful hand-winnowing by a skilled cooly will, therefore, remove any undesirable material, including the magnetic material that would otherwise have been removed by the electromagnet of the commercial extractor.

The heap **B** must be continuously removed. If a large pile collects there, flaky leaf is apt to get mixed with the good tea.

A small quantity **C** contains some flaky leaf, and had to be re-blown. The fibre and most of the flaky leaf is blown clean away to the back of the room. This can be cleaned in the usual way.

The various dhools were examined for tip. If there was much badly twisted, or very flaky tip, it collected in the pile **C**, and could be separated from the flaky and waste tea by re-blowing with less air. If this could not be done, it is possible to hand winnow the small quantity of tea in this pile and remove the flaky tips.

SUMMARY

A blower or tea winnower appears to compare favourably with the commercial extractors in use in providing a method for the extraction of foreign matter from tea.

The blower is capable of giving very satisfactory service if directional and volume control of the air blast is possible. A system of baffles capable of effecting this is described. These may be made from spare materials found in almost any factory, by estate labour, at a very trivial cost.

Every grade of tea except the dust can be cleaned in this way.

* See diagrams facing page 125.