THE MANUFACTURING AND MARKETING OF TEA IN KENYA AND UGANDA

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Introduction

Tea factories built in East Africa during the pre-war years have an external appearance similar to those in Ceylon, or alternatively consist of several buildings of assorted shapes and sizes added on during the years to cope with increasing crops. Factories of more recent origin are neat and compact and are more efficient in design as is evident from Figure 1 which shows a modern factory with an annual output of approximately 1½ million pounds of made tea per annum.

Mention has already been made of the very high plucking standard in both Kenya and Uganda (Kirtisinghe 1967). The care taken to ensure that the leaf reaches the factory with the least possible degree of mechanical damage is also noteworthy. In this operation too, the smallholders are better organized than on the large majority of company-managed estates. Figure 2 shows a vehicle used for the transport of leaf from smallholdings with the metallic leaf baskets stacked in position.

Withering

This operation is carried out almost exclusively in troughs. The first troughs built in Kenya and Uganda were 4½ ft in height and 6 ft wide. Troughs of more recent origin have an overall working height of 3 ft and this modification has very considerably simplified operation. In a few instances, the breadth of the trough has also been reduced to 5½ ft to facilitate the turning over of the leaf.

The accepted norm for spreading the green leaf is 5.5 lb per sq ft of leaf spreading area but this is exceeded by up to 50% at times when the factory is dealing with rush crops. In factories where a reasonable wither is expected, the troughs are designed to supply 7 to 9 cu ft of air per lb of green leaf per minute. The largest trough fans are of 38 inches in diameter and the trough sections do not exceed an overall length of 48 ft. The sides of these troughs are often fabricated from galvanized iron sheet.

Double decker troughs are also found in operation in some factories. In these units a single 38 inch fan provides air simultaneously to two troughs built directly one above the other leaving clear 6 ft working space between the top of the lower trough and the base of the one above. The ceilings in these factories are necessarily high. Having seen them in operation, the writer is convinced that some modification would be found necessary before these troughs would suit the requirements in Ceylon.

Very often there is no arrangement to duct warm (conditioned) air into the troughs. The absence of this duct does not present too many problems to the estates concerned because the wither required by them is very much softer than anything seen in Ceylon, being in the range of 30 to 35% made tea to withered leaf. This compares with an average outturn of approximately 45% in Ceylon. Some factories duct warm air directly from the heat exchanger attached to the drier and feed it to the troughs through control valves. This again is possible in

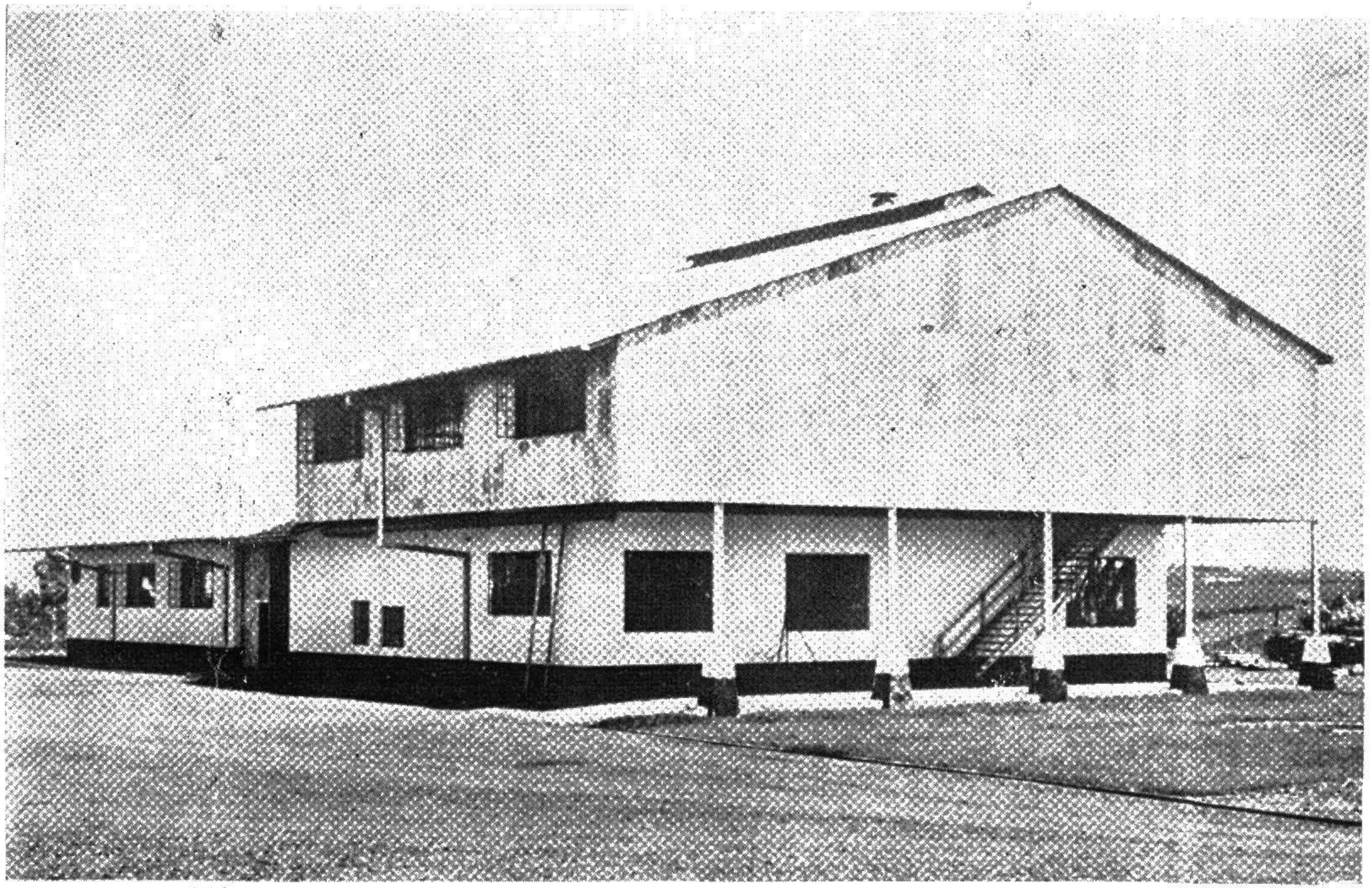

FIGURE 1A — *A modern tea factory on an estate in East Africa*

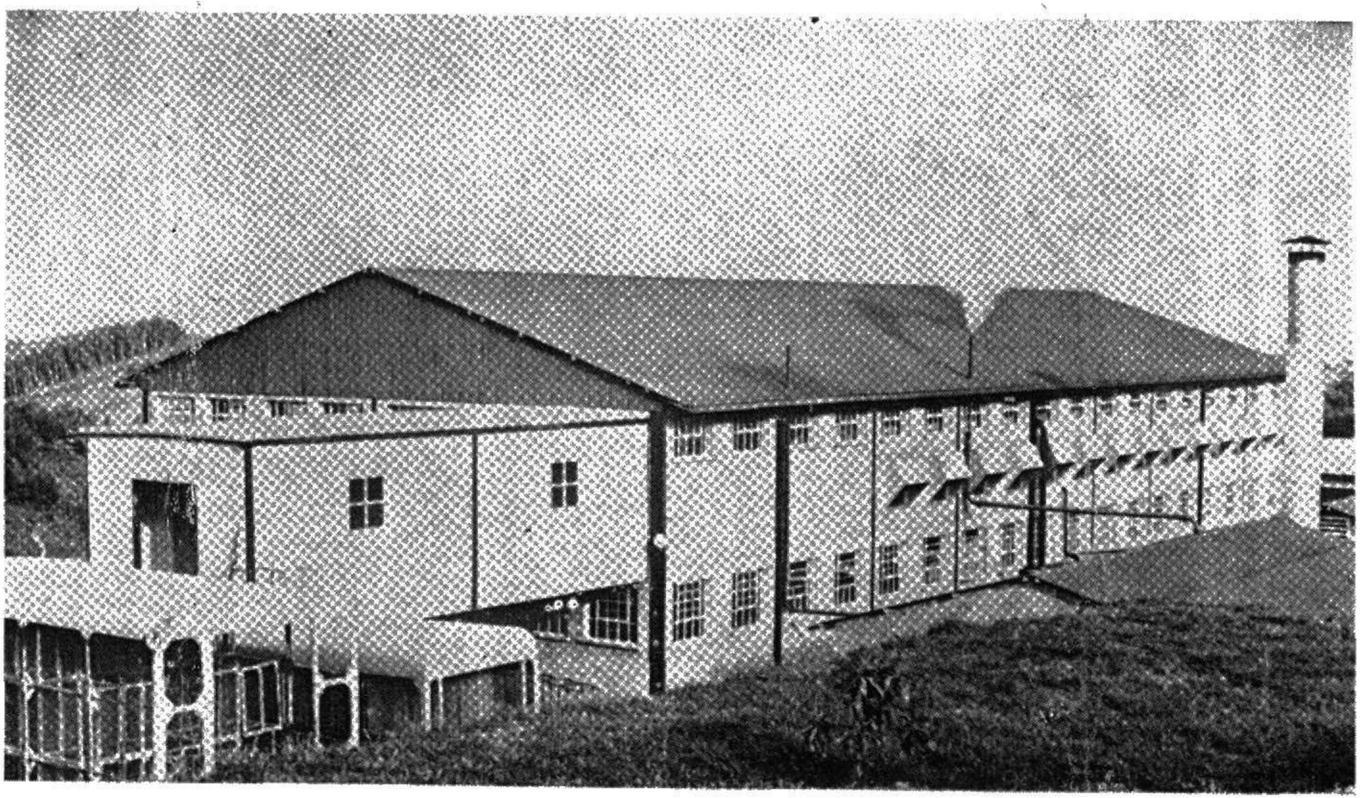

FIGURE 1B—*A tea factory for 1500 acres of smallholdings in East Africa capable of an output of 2½ million lb per annum*

FIGURE 2 — *Leaf transport for smallholdings*

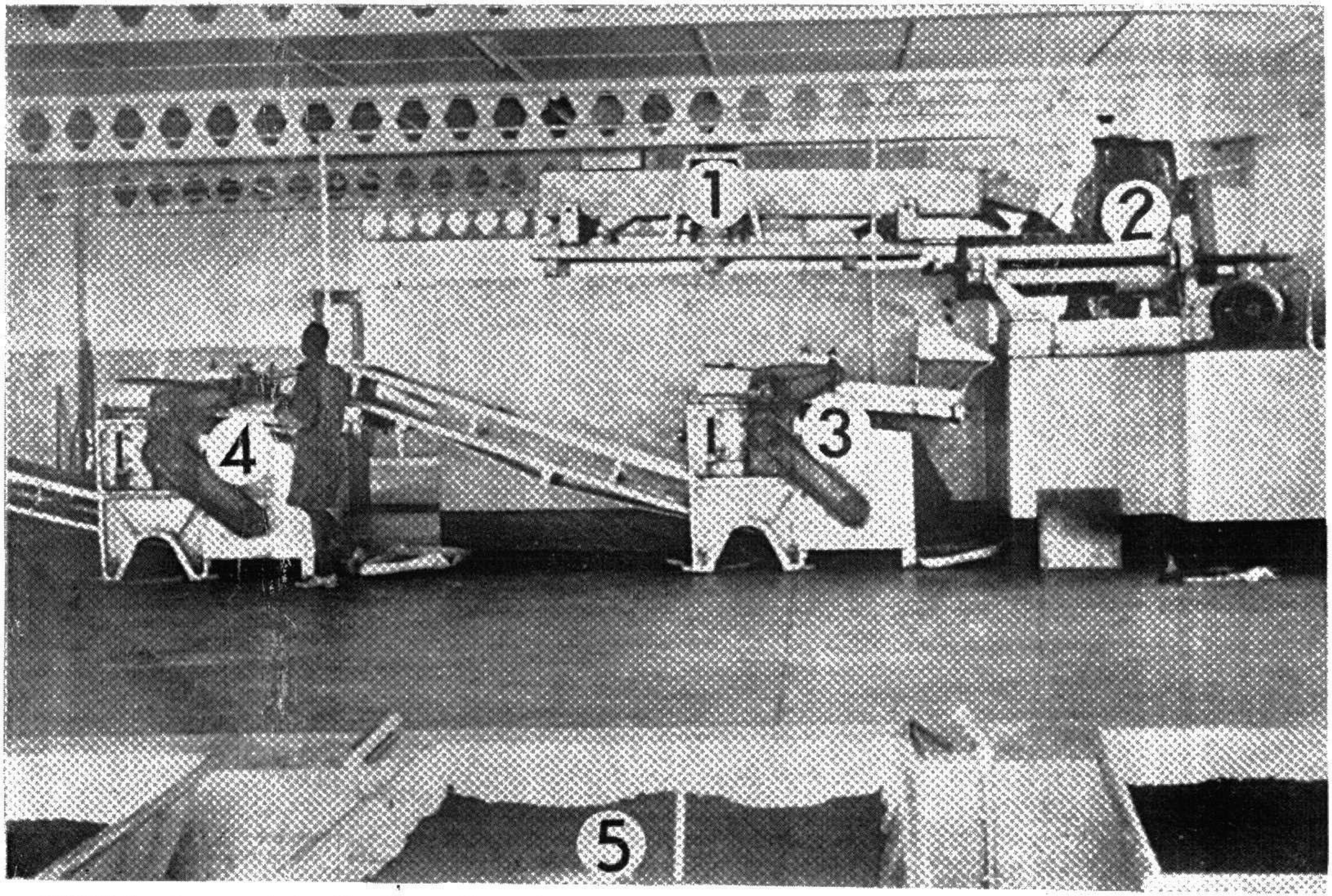

FIGURE 3 — *Arrangement in the rolling room 1 — Withered leaf sifter; 2 - 15 in Rotorvane; 3 - and 4 - 30 in CTC machines; and 5 - GWA fermenting unit*

East Africa because the driers are used with the fan valves about 7/8ths closed in order to prevent an excessive drier blow out of the fine CTC teas. Less often, troughs are coupled with individual oil-fired heat exchangers or provided with individual steam-heated radiators.

Holding troughs are also in use in some factories. These troughs are used for leaf storage and can hold 4000 to 5000 lb of leaf at a leaf depth of 3 to 3½ ft. The leaf does not wither to any appreciable degree while kept in these storage troughs because the high-speed fan supplies only just sufficient air to prevent the leaf from heating up. The leaf stored in these troughs has to be discharged subsequently and withered to the correct degree in the normal troughs. Managers tend to use holding troughs only very sparingly because of the extra labour and handling involved in their use.

The first factories to mechanize the withering operation did so by installing withering drums. These are now generally unpopular and those factories which already possess these drums use them to handle excess leaf during which rush periods or not at all.

Rolling

A single pass through a 15 in Rotorvane followed up with two successive cuts through CTC machines is by far the most commonly adopted form of rolling in both Kenya and Uganda. Figure 3 illustrates one such arrangement and shows the movement of the leaf through the withered leaf sifter into the 15 in Rotorvane and then through the two CTC machines. In the foreground of this picture, the trolley fermenters can be seen. Their operation is discussed in greater detail under the appropriate heading.

To suit this type of manufacture, withered leaf containing approximately 65% moisture is sifted to remove sand and grit and then fed direct to the 15 in Rotorvane fitted with forward-pitched vanes. More often than not, the Iris end plate is kept in the fully open position. The operational speed of the Rotorvanes seem to vary a little from estate to estate but were mostly in the range of 30 ± 5 rpm.

The leaf discharge from the Rotorvane is taken up immediately on a conveyor into the first CTC machine and then along a second conveyor for the next CTC cut. Permanent magnets are fitted over the conveyor to minimize the risk of damage to the CTC cutter cells. The two rollers of each CTC machine move at different speeds, the slow roller working at a speed between 75 and 100 rpm and the other ten times as fast.

The CTC rollers need careful alignment and setting. These rollers are sometimes set by passing an aluminium foil strip through the gap while the rollers are turned by hand and the impression formed thereon is carefully matched with a master print. Quite a few of the factories visited achieved the same result by placing a light source directly below the roller gap and the setting judged by eye estimation, viewing from directly above.

Not a great deal of effort is put into matching the output of the Rotorvane with the intake of the CTCs. In one factory, two 15 in Rotorvanes were feeding simultaneously two 30 in CTC machines in tandem while the other extreme observed was of a single 15 in machine feeding two 48 in CTCs in tandem. Casual observation would seem to indicate that both factories were selling their teas equally well.

Rotorvanes are inexpensive to maintain, but the savings in rolling room labour costs by the installation of a Rotorvane-CTC unit in preference to an orthodox system are largely offset by the increased costs of CTC roller upkeep. For instance, the full sharpening of a pair of 30 in rollers costs £50 and this is found necessary about once each year. Parallel cuts are required six to eight times annually and cost £27 per sharpening for the 30 in machine. A replacement set of 30 in rollers required every three years or so costs £790.

Some factories carry out their rolling programme exclusively in Triturators (Figure 4) while others carry out a Triturator-CTC form of rolling in a manner almost identical to that of the Rotorvane-CTC type of manufacture. The performance of the Triturator in East African factories with a reasonable standard of leaf seems very satisfactory and would justify testing to determine its suitability under Ceylon conditions.

Rolling in orthodox-type crank rollers can only be seen in a very few of the oldest factories in existence in both Kenya and Uganda. Quite a few estates which were carrying out an orthodox form of rolling procedure earlier, are now prepared to donate these rollers free of charge to any interested party. One factory adopting a semi-orthodox form of rolling did an initial roll of 55 min followed up with three further rolls each of 45 min duration. The bulk was first reduced to approximately 10% and then sent through a CTC roller for a single cut as the management was not prepared to make OP's or other large leaf teas.

Fermenting

The fermenting operation is being largely mechanized in both Kenya and Uganda and fermenting troughs and skips have replaced almost entirely conventional forms of table or floor fermenting as practised in Ceylon. Drum fermentation is also carried out in a single factory in the Nandi Hills area but the writer was unfortunately unable to see it.

Geo. Williamson Africa (GWA) fermenting unit requires loose and even loading of the trolleys (seen in Figure 3) to a depth of eight to ten inches and an even air flow through the leaf. Period of fermentation varies from estate to estate, but would generally be in the range of 1 hr 30 min to 2 hr 30 min. The optimum air temperature in the duct is considered to be somewhere in the range of 65°F to 72°F at a relative humidity of 75 to 80%. An air pressure of one inch to 1¼ in water gauge in the duct ensures an initial bulk air flow rate of 10 to 16 ft per minute, and the air flow rate through the fermenting dhools is subsequently changed as required to attain certain temperature characteristics in the dhool with the help of controlling valves.

The temperature in the fermenting dhools is not uniform within the troughs. The lower layers of the leaf are the coolest and are consequently the least fermented at the time of firing. The leaf in the middle is considered to be fermented to the optimum degree while the leaf in the top strata of the trough ferment more rapidly. There is considered to be some danger of the teas going soft in the top layers if the temperature in the section is allowed to exceed 85°F. The humidifying unit and duct also require periodical cleaning, to prevent the teas absorbing an unpleasant taint from the air being blown through.

The first fermenting skips to be introduced in East Africa cost over £20,000 complete with accessories and is said to have reduced the labour requirement in a factory producing nearly 2 million lb annually by only five men per day! The skips now being put in cost approximately a tenth of the original price and employ the same principle of a forced air draught through the fermenting leaf as with the

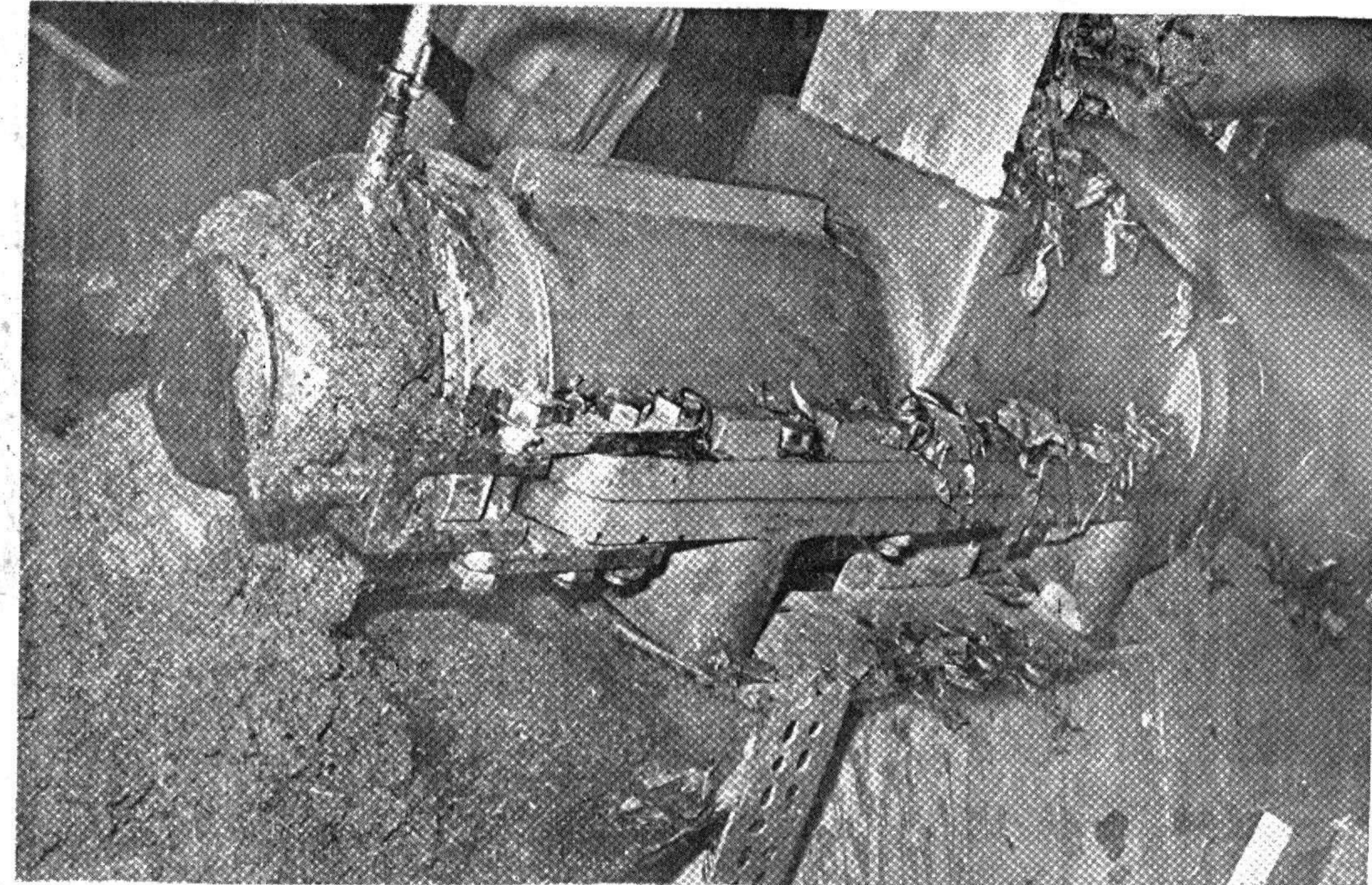

FIGURE 4 — *A Triturator in operation*

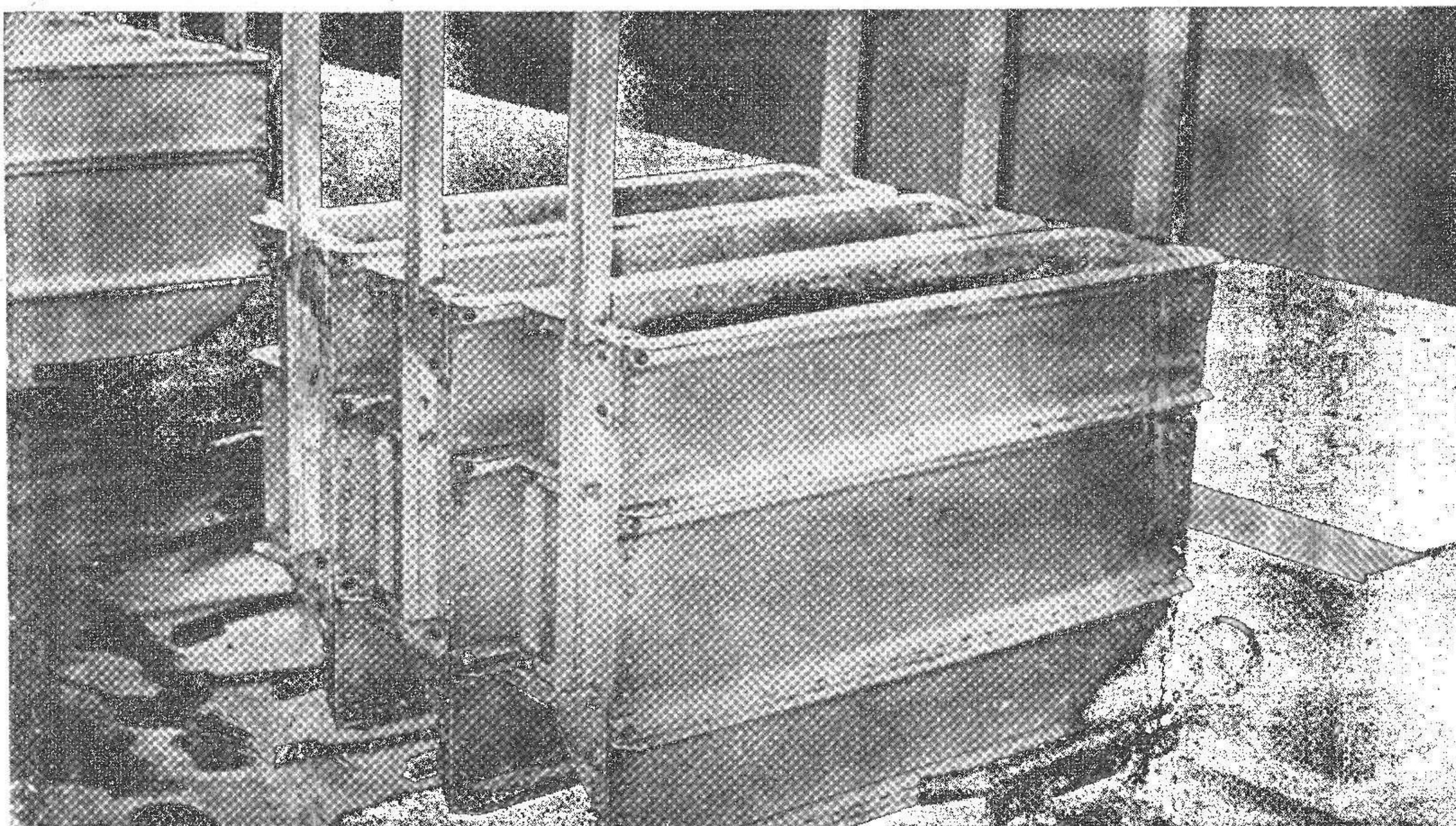

FIGURE 5 — *Skip fermentation*

GWA unit. The skips move on an overhead monorail conveyor and the Rotorvane-CTC dhools are fermented in these units at a depth of over 2 ft. The skips are shown in Figure 5 in use, plugged to the duct supplying humidified air.

Firing

Driers are generally operated at an inlet temperature of 190°F to 200°F, an outlet temperature of 130°F and a period of firing ranging from 18 to 21 minutes. In these respects and also in the moisture content of the dried product, the operation resembles that in Ceylon but the drier outputs are exceedingly low as is only to be expected from the withers already described. For instance, a standard 6 ft drier with three chain circuits would give an output of only 300 to 350 lb made tea an hour as against the figure of 450 to 500 lb in a comparable drier in Ceylon. For this reason and also because of the large acreages serviced by each factory, estates in general prefer to go in for the largest available driers and consequently 6 ft models are the most common.

Davidsons have recently introduced a low pressure two-stage drier which has several interesting features. The drier is relatively low and the fermented dhools are fed directly into the top drier circuit obviating the need for a feeding chain. This drier has also only two endless chain circuits as against the three in the driers marketed in East Africa hitherto and the air flow rate through the drier is also substantially reduced. The reduction in the air flow rate is a definite advantage in these countries as it helps to minimize the blow out of the fine Rotorvane-CTC dhools.

Marshalls are also actively developing a 'hot-feed' drier which has a very considerably enhanced output to that of a standard drier of comparable size. This 'hot-feed' arrangement was seen operating satisfactorily when attached to a conventional type of 6 ft drier and it is expected that a 6 ft drier working in Ceylon with such an arrangement would have an output of very nearly 1000 lb made tea per hour. A large number of factories in Ceylon are confronted with the problem of inadequate drier capacity and this matter deserves further examination as there seems to be the possibility that an existing drier could be converted into a 'hot-feed' arrangement for a very moderate outlay.

Grading

Most factories make only a limited number of grades, often only five or six. This is largely possible because of the fine and even CTC type of tea and the absence of a big bulk. Grading is done mainly on Chota sifters. The mesh sizes vary a little from estate to estate with the most widely used combination of mesh sizes from the top to the bottom tray being 12, 14, 16, 30 and 40. Tea particles over the 12 mesh are crushed and re-sifted. BP 1 is taken through 12 and over the 14 mesh. The fraction over the No 16 mesh is re-sifted and what comes over the 16 the second time is also amalgamated with the BP 1. Through 16 and over 30 is PF. The teas through the 30 mesh but over the No 40 form the PD grade and through 40 gives rise to the D1 grade. The description of the grades as well as the sifting procedure outlined varies somewhat between estates. Where the standard of plucking is not exceptionally high, a Middleton or an Electrostatic stalk extractor is used giving rise to BP 2, F 1, F 2 and D 2. Floor sweepings and waste refuse teas which amount to 0.5 to 0.6% of the crop are also carefully collected in bags and find a ready sale.

Costs of production and sale prices

Typical figures for the cost of production worked out in terms of the cost per lb of made tea at a new factory dealing exclusively with leaf from smallholdings are given in Table 1.

TABLE 1—*Production costs at a factory attached to 1500 acres of tea*

Item	Cost (Ceylon cents)
Superintendent	5.12
Staff	2.11
Travelling	0.01
Passage leave pay	1.93
Medical	0.13
Stationery	0.08
Postage, telegrams, *etc*	0.14
Insurance	3.94
Upkeep	0.20
Roads	0.13
Cars	0.84
Provident fund	0.39
Miscellaneous	0.68
Holiday leave pay	0.04
Watchers	1.01
Directors attendance fees	0.52
Agents commission	5.05
Interest	17.04
Directors annual fees	1.84
Manufacture	13.80
Freight and packing	8.12
Despatch	1.55
Cess	1.35
Machinery and factory maintenance	1.99
Green leaf purchase	116.02
TOTAL	184.03

It is interesting to note from the above that the overall cost of production works out to the equivalent of 184.03 Ceylon cents when the price paid for the green leaf is nearly 25.8 Ceylon cents per lb assuming an overall outturn of 23.3% made tea to green leaf.

The price realized at the London sales of Rotorvane-CTC teas from yet another of the KTDA factories are compared below in Table 2 against the valuations of the same teas by the TRIC taster based on standards set for orthodox teas and on market conditions prevailing at the Colombo auctions during the latter part of October 1966.

TABLE 2—*London sale of smallholder Rotorvane CTC teas compared with TRIC valuations based on Colombo market conditions*

Grade	Approximate percentage outturn	London valuation s d	TRIC valuation Rs
PF	55—57	5 6	3.00
BP I	10	5 0	2.40
PD	20—22	5 0	2.90
D	5	4 1	2.25
D 1	5	4 6	2.50
BP	2	4 6	1.90

The prices realized in London and the TRIC valuations are not very different when allowance is made for the difficulties that the taster encountered in valuing CTC teas by the standard set for teas from orthodox manufacture. There was, however, a very wide difference in his valuations of packetted teas available in the market and its price to the consumer. This is illustrated in Table 3 below.

TABLE 3—*Prices of packetted tea available to the consumer prepared on orthodox standards*

Grade	Price to consumer	Ceylon equivalent per lb (Rs)	TRIC valuation (Rs)
1	3s 25 cts for ½ lb	4.39	1.90
2	1s 35 cts for ¼ lb	3.65	1.60
3	1s 05 cts for ¼ lb	2.84	1.00

Valuations given in Table 2 are an indication of the potential the smallholders are capable of attaining in the production of quality teas in Kenya. The most surprising feature about sales in East Africa is, however, that a grade termed fibre and fluff consisting mainly of floor sweepings and other refuse is bagged and sold in Mombasa for export at prices ranging from approximately 2s to 3s per lb.

Tea sales

East African teas came into the Kenya market in an appreciable quantity around 1928 at a time when she was importing approximately one million lb of tea from Ceylon and India, but by 1932, local production was adequate to meet domestic requirements.

The Kenya Tea Growers Association reached an agreement with Brooke Bond (East Africa) Ltd in 1938 whereby this company became the sole packer and distributor for all members of the Association. Some years later this agreement was extended to the territories of Tanzania and Uganda through the medium of the Association of Tea Growers of East Africa commonly known as the " Pool ". Members of the Association give priority in supplying the requirements of the " Pool " and sell the remainder in the Nairobi auctions for export only or ship the teas directly to London. A certain quantity of tea in East Africa is disposed of by forward contract and also by private sale.

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