

During the past 30 years, numerous scientists and research engineers made machine milking the subject of exhaustive study and experimentation. Accurate knowledge regarding the effect of machine milking on the health of the dairy cattle, the udder, and the milk production has been available for more than 20 years. Based on these early findings, work has been carried on by the research institutes of Kiel and Weihenstephan where scientists apply themselves exclusively to dairywork. In addition, the "Max-Planck-Institut für Tierzucht und Tierernährung" in Mariensee (stock breeding and feeding research institute), "Lehr- und Versuchsanstalt für Viehhaltung" in Sophienhof near Flensburg (dairy farm laboratory and training school), and "Institut für Tierzucht und Milchwirtschaft" in Giessen (dairymen's advisory board) did and still do a considerable amount of research on machine milking and related subjects.

German manufacturers of milking machines and dairy equipment have based their designs not only on their own broad experience, but also on latest scientific advances which the above research institutes made available to them. Naturally, this has reflected rather favourably on new designs. Nearly all types of milking machines marketed by German manufacturers are thoroughly tested as to material, workmanship, performance, and utility by scientific and engineering institutes. Testing procedures are uniform. They were outlined by "Deutsche Landwirtschafts-Gesellschaft DLG", Frankfurt (German Agricultural Society). In addition, users have been questioned as to the utility of the equipment. All of these findings and test results as well as detailed descriptions of the various designs of milking machines tested are currently published in the Society's reports on mechanical farm equipment. All of this shows that the prospective user of German milking machines can be sure that he is offered thoroughly tested and service-proved equipment.

The number of milking units used by German farmers has increased from 6000 to nearly 140,000 during the past seven years. This in turn resulted in design improvement. Modern German milking machines are characterized by several outstanding advantages and entirely new features.

Machine Milking Equipment for Use in Barns

Rapid pulsation milking as recently developed by Dr. Eisenreich of Weihenstephan and his staff is gaining increasingly in importance. Based on

Dr.-Ing. Dr. agr. M. Hupfauer, Conservator, Weihenstephan

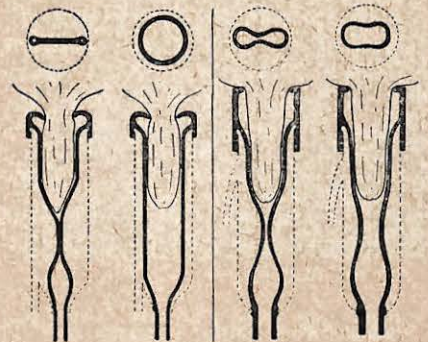
Modern Milking Machines

this principle, the "Flaco Pionier" milking machine by F. Landwehr & Co., Maschinenfabrik, Isselhorst i. W., is characterized by its high number of pulsations which range from 120 to 140 per minute. Pulsations are produced by a pneumatically operated diaphragm pulsator. The machine is designed to imitate very accurately the suction of the calf on the cow's teat. A thorough examination of the milking action as produced by the calf revealed that the calf sucks milk from the teat in a practically continuous stream and that it swallows the milk about 120 or 130 times a minute. In an endeavour to give the teat cups the shape of a calf's mouth, the company developed an especially long rubber cup. This cup is characterized by a wide cushion top. Comfortable and safe, it produces a tight seal and bears against the udder at very small pressure. A large annular recess inside the top equalizes the effect of the vacuum within the teat cup. Common machine milking provides between 40 and 60 pulsations per minute. During the rhythm of a single pulsation, the cup is alternately fully inflated and completely collapsed. When collapsed, the cup closes tight around the point of the teat and shuts it off the sucking action of the vacuum pump. As the number of pulsation is very high in the "Flaco" machine, neither full inflation nor complete collapse of the teat cup is effected. The newly introduced throbbing action differs completely from conventional machine-milking action in that it produces gentle and moderate suction on the teat very similar to the natural sucking action of the calf (fig. 1).

Instigated by the German Agricultural Society, in 1955 and 1956 the machines of the new type were put to extensive practical tests. The equipment

was applied to spotted dairy cattle of mountainous regions, to black dairy cows, and to cattle of a breed as kept in low and level country. As compared with machines of the conventional type, the newly developed equipment produced superior results. The milking time was much shorter in every instant. The test included animals that took differently to machine milking and that differed in their state of lactation and in their age. Another proof of the superiority of the new method over established procedures is the well-known fact that a higher milking speed is agreeable to the animals. Of course, it must not be overlooked that the constant sucking action of the machine requires experienced personnel since continued milking of the empty udder might cause irritation.

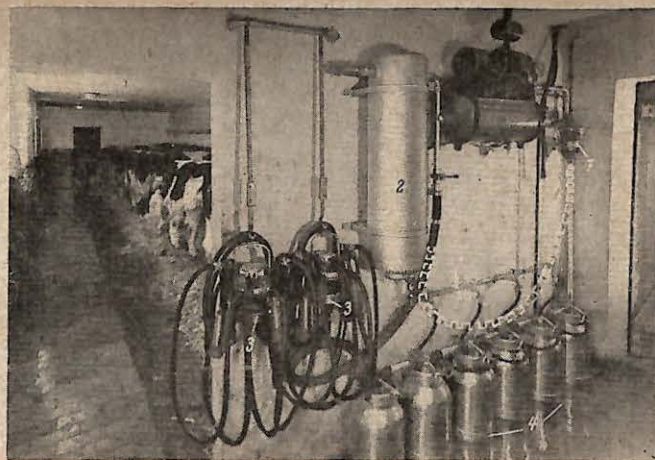
Based on broad experience, a remarkable line of milking machine designs suitable for a wide range of applications is manufactured by Westfalia Separator A.G., Oelde i. W. The German Agricultural Society tested and approved the "Westfalia" milking machine as early as in 1927. In the course of the years, improvement were added to the com-



1) Diagram showing the rhythmic throbbing of the teat cup during conventional and rapid-pulsation milking



2) "Westfalia" filter-type milking system (Westfalia Separator AG.)
 1 double filter-type milking unit for milking two cows at a time similar to the two-pail milking system), 2 vacuum hose to pulsator, 3 milk hose serving both milkers, 4 vacuum line, 5 milk line



3) Milk storage room with "Westfalia" filter-type milking equipment (Westfalia Separator AG.)

1 milk receiver, 2 rinsing tank (used as spare vacuum tank during milking and as receiving tank for the rinsing water when the line is rinsed), 3 place for filter plates, 4 bank of cans (consisting of 6 cans, 4 of which are fitted with cooling rings). The double filter-type milking unit milks two cows at a time.

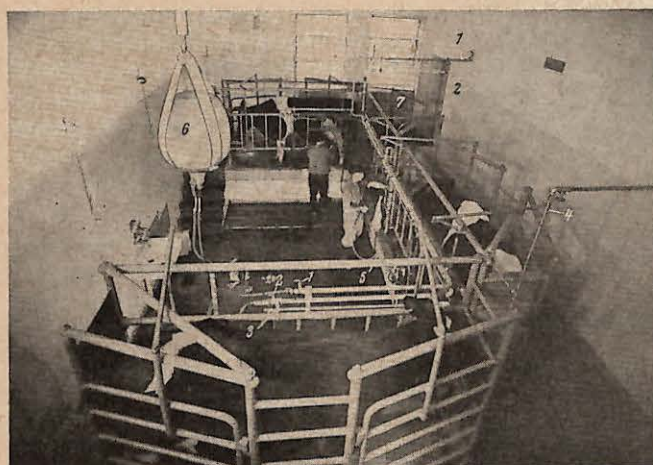
pany's barn-type milking system which employs floor-type pails and a stationary pump. This system, which is specifically designed for small dairy farms, was tested again in 1953 and in 1954 and was approved as "highly suitable". In addition to this standard design, the company devised a new system for machine milking the cows in their stalls. This filter-type milking system (fig. 2) includes milkers from which the milk is delivered to a stationary milk line of transparent plastic material or stainless steel via a double filter-type milking unit. The line which goes by the stalls ends in the dairy room of the barn, where it delivers the milk to a bank of cans via a milk receiver. The receiver forms a part of this vacuum-type milking station (fig. 3) and serves the purpose of catching the nylon plugs which are being sent through the milk line after milking and rinsing. To enable the user to rinse the line, the company provides a separate tank to receive the rinsing water. The bank of cans consists of standard milk cans with special covers on them. Through the covers, the cans are interconnected by transparent plastic pipes in a manner so that these cans are filled successively. Cooling rings are mounted on the necks of the cans for efficient cooling. Cooling water circulates through these rings. When dairy rooms are close to the stalls, the "Westfalia" filter-type milking system simplifies the process of milking considerably in that it eliminates the need of carrying heavy pails around, emptying pails into cans, and straining the milk.

Machine Milking Stands

Modern labour-saving methods of production have been applied to machine milking of dairy cattle housed

in large barns. Machine milking stands, as have been manufactured and marketed by Westfalia Separator A G. for many years with great success, insure top milking economy. The company supplies these stands to suit specific barn requirements. Whereas in barn-type milking systems, the milking unit is taken to the cow, machine milking stands provide that the cow walks to the milking unit to be milked. This offers the possibility of producing a very clean type of milk in which the bacteria count is reduced to a minimum.

Figure 4 illustrates the "Westfalia" machine milking stand. U-shaped to save space, the stand is equipped with four stalls. The illustration shows the operators' position which is so that a maximum of time is saved. While one of the two operators washes the udder with a shower spray supplied from a water line in the lower section of the milking stand, the other slips the cups on the teats. The milking units deliver the milk directly into the milk line.



4) "Westfalia" machine milking stand (Westfalia Separator AG.)

- 1 vacuum line
- 2 milk line
- 3 pulsator line
- 4 pipe delivering water to the automatic watering trough,
- 5 pipe below the lower edge of the stand (not visible) supplying the shower sprays
- 6 tank holding disinfectant,
- 7 central heating

As a special feature of the "Westfalia" stand, a tank of disinfectant is suspended from the ceiling. This disinfectant serves the purpose of keeping milk line and milking units free from bacteria. Disinfection is carried out during intermissions between milking. As soon as all cows are milked, nylon sponges are sucked through the milk lines to clean them. Upon leaving the line, the sponges are caught in the vacuum milk filter mounted in a separate storage, cleaning and cooling room which is close to the milking stand. The cleaning procedure includes rinsing with cold water, cleaning with a solution of disinfectant at 115° F (45° C), and a final rinsing with warm water. After that, the lines are filled with disinfectant from the tank on the ceiling. The solution is kept in lines and milking units till the next milking, when it is sucked back into the storage tank by an ingeniously devised arrangement. The solution needs to be replaced just once or twice a week. Washing facilities for the operators, a line to the watering troughs, and a central heat-

ing system complete the equipment of this ultra-modern machine milking stand.

A look into the adjacent room (fig. 5) shows the rinsing water tank (1) which simultaneously serves as a spare vacuum tank, and the two vacuum milk filters (2) to which milk is delivered from the milking stand through the stainless steel lines (3). A bank of cans (4) shows in the foreground. Similar to the arrangement described in connection with the stall-type machine milking equipment, the covers of the cans are so connected by piping that the cans are filled successively. To be seen in the background, the modern washing equipment for pails, milking units and machine components is manufactured by Ernst Göbel KG., Stuttgart-Feuerbach, according to Dr. Paul's patents. This washer has been subjected to thorough tests by "Institut für Tiergesundheit" (animal health research institute), Kiel, and by "Lehr- und Versuchsanstalt für Viehhaltung" (dairy farm laboratory and training school), Sophienhof, an organisation sponsored by the Schleswig-Holstein Chamber of Agriculture. The washer facilitates cleaning considerably.

Instead of using a vacuum milk filter in connection with a bank of cans, users can have a pulsator-controlled milk sluice through which the milk is discharged into a receiver tank where it is stored at low temperature. Low-temperature milk storage tanks (fig. 6) are manufactured by Eduard Ahlborn AG., Hildesheim.

Maschinenfabrik Miele & Cie., Bielefeld, noted manufacturers of milking machinery, developed a very modern type of machine milking stand. Figure 7 offers a partial view of a "Miele" milking stand. A measuring vessel is provided to control the milk production of the cow. The vacuum line to be seen behind the measuring equipment in the upper section of the stand is connected to the vacuum pump. A vacuum hose runs from this line to the pulsator to be seen in the foreground. At the side of this hose, a second vacuum hose runs to the milk cock which may be set to delivering the milk from the milking unit either through another hose to the milk line, or to the measuring vessel where the milk production of the animal can be checked. The milking unit is not shown in the illustration. To run the milk from this unit to the measuring vessels, the operator sets the cock to "check".



5) Storage, cleaning, and cooling room forming a part of a "Westfalia" machine milking stand equipped with a "Favorit" washer for cleaning milk cans and milker units by Ernst Göbel KG.

1 vacuum spare and rinsing water tank, 2 vacuum milk filter, 3 stainless steel milk line, 4 two banks of cans comprising ten 10-gallon cans each, 5 can washer acc. to "Dr. Paul", 6 milk line and milker unit, cleaner and rinser acc. to "Dr. Paul"

6) Milk storage room as part of a "Westfalia" machine milking stand equipped with low-temperature cooling facilities by Eduard Ahlborn AG.

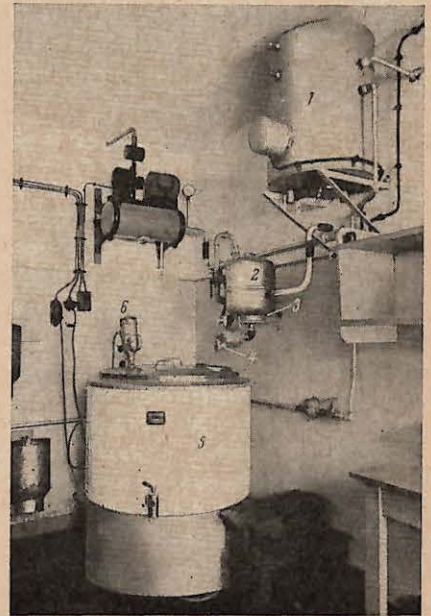
1 electric hot water storage tank, 2 detachable hood, 3 filter disc, 4 pulsator-controlled milk sluice, 5 "Ahlborn" low-temperature cooling vessel (75 gallons per hour to 37° F), 6 electric agitator

After the milking, he sets the cock to "0", to shut the vacuum line off the measuring vessel to admit atmospheric pressure. Then he can draw off a small amount to test the quality. When he sets the cock to "suction", the milk will flow directly into the milk line.

Miele & Cie. also supply equipment designed to milk the animals in their stalls. Automatic suction is provided. The milk line which is either of transparent plastic or stainless steel is run from the stalls to an adjacent room where the milk is successively strained, vacuum precooled,

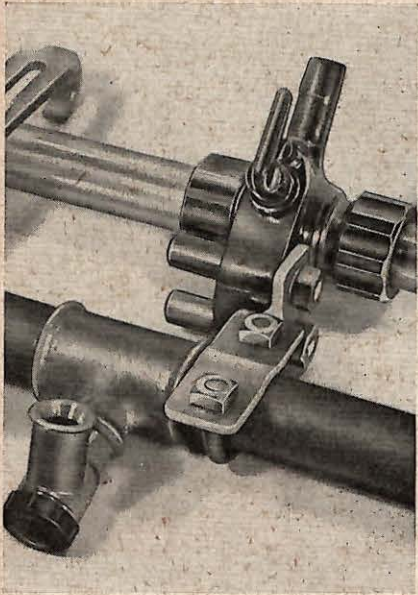


8) Milk storage room as part of a "Miele" stall-type milking system equipped with pre-cooler and low-temperature cooler (Miele & Cie.)



7) "Miele" machine milking stand equipped with measuring facilities

1 vacuum line, 2 milk hose running from cock to measuring vessel, milk hose from measuring vessel to cock, milk line running from cock, 4 double air hose (connecting pulsator to milker unit)

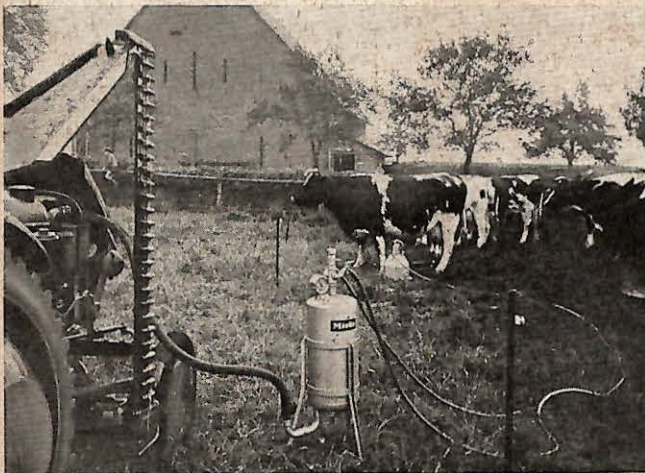


9) Automatic vent valve and milk cock of a "Miele" machine milking system

vacuum cooled to the final low temperature of 37° F (3° C), and finally stored in a well insulated tank (fig. 8). The system provides facilities for cleaning all pipes and lines by forcing hot disinfectant through them with a rotary pump. The vacuum line is equipped with automatically acting vent valves to enable operators to connect the vacuum hose quickly (fig. 9). Fresh filtered air is admitted to the vacuum suction line through which the milk is delivered for the purpose of improving the milk flow and reducing milk evaporation.

Tractor-Engine Powered Milking Equipment for Use on Pastures

Manufacturers of machine milking equipment will prepare detailed propositions to suit specific requirements on pastures. Figure 10 shows the use of a tractor engine as a vacuum pump for the operation of milking equipment. The design provides a tank for



10) Machine milking on the pasture with tractor engine and "Miele" vacuum equalizing vessel (Miele & Cie.)

maintaining a constant vacuum and equalizing the pulsation of the motor. The tank is fitted with a vacuum gauge, connecting sockets and valves. Not every tractor is suitable. Large-diameter air intake and governor control are required.

Mobile Milking Units

Mobile milking units are designed for producing and processing milk on an economy basis. They simultaneously represent an organisational innovation which has proved highly satisfactory for users. A mobile milking unit consists of a transport vehicle which carries milking equipment and milk storage facilities. It is attended by a crew of trained operators. Dairy farm cooperatives usually operate one or several of such units which are sent out from farm to farm, mornings and evenings. Requirements for successful operation of such units include a good state of health of the dairy cattle. Besides, a vacuum line should be installed in the barn and a cooling water tap as well as a connection to the electric power supply should be available outside the barn to run the unit. Experience proved that a team of one operator and one helper can milk about 120 cows in 3 hours. This shows that with this outfit 120 cows can be milked twice a day and that the milk thus produced can be delivered to the dairy once in the morning and once in the evening.

When the truck arrives at the farm, the operators first make the necessary connections and then milk the cows. What the farmer needs for his own economy can be returned to him. When all cows are milked, the various milking units are disinfected. As the milk is passed through a meter, the quantity of milk produced in a farm can be readily determined. A tap permits samples to be taken to deter-

mine the fat content of the milk as produced by any one farm. Twice a day, after the truck returns from its tour in the morning and at night, it is thoroughly cleaned and disinfected in the dairy.

Truck-mounted milking units of this type are manufactured by Gebr. Diessel, Hildesheim. The company mounts the equipment on a 1.5-ton Diesel-powered truck by Hanomag A G., Hannover-Linden. Figure 11 shows the unit with panels folded up. Whole and skim milk tanks are to be seen behind the milking machine. The arrangement provides that the skim milk can be returned any time subsequent to milking. The equipment further includes an electric water heater, a milk meter, a tank for disinfecting teat cups with a tap on its bottom for disinfecting shoes, a hand-wash basin, a rack for sampling bottles, a plate-type water cooler, a milk pump, and another meter for measuring the quantity of skim milk returned.

The capacity of the aluminium raw-milk tank is 250 gallons (1000 litres), whereas the aluminium skim milk tank holds 100 gallons (400 litres). Both tanks are polished inside. A rack for flexible vacuum tubing and cooling water supply and discharge hose is provided. Finally, the equipment includes an electric cable and a switchboard panel. With the side panels folded down, the outfit is completely sealed off the outside and resembles a trunk. When the panels are folded back, they form a rain shelter. The milk tanks are fitted with man-holes for easy access.

The rack for holding the lids covering the milking pails is so designed that the teat cups are automatically run through a bowl of disinfectant before the operator can apply them to the udder. The milk is first delivered to



11) Mobile milking unit by Gebr. Diessel, mounted on a 1.5-ton "Hanomag" truck

a receiver tank. From this tank, the milk flows by an electric feeler unit which automatically switches on the milk pump and the cooling water supply. From the cooling unit, the milk is run to the raw-milk tank via a milk meter. In collaboration with E d u a r d A h l - b o r n A G., noted manufacturer of dairy equipment, Daimler-Benz A G., Gaggenau Division, developed a mobile milking unit (fig. 12). The unit is mounted on the "Unimog" tractor. Equipped with all-wheel drive, the 30-hp. Diesel-powered tractor is designed for off-the-road travel. With its two sets of twin tyres on the rear axle, it is specially suitable for passing through unpaved roads, mud and snow. This tractor features outstanding reliability of service.

The "Ahlborn" body is equipped with a raw-milk tank holding 200 gallons (800 litres), two skim-milk tanks of 75 gallons (300 litres) each. One of the skim-milk tanks serves as a spare raw-milk tank. The raw-milk tank is of chrome-nickel steel whereas the skim-milk tanks are of pure aluminium. Operators pour the milk into a receiver tank from where it is delivered to the raw-milk tank by a limit-switch controlled centrifugal pump (6.5 gpm = 1500 litres/hr) via a "Sie-

12) "Unimog" mobile milking unit (Daimler-Benz AG. / Eduard Ahlborn AG.)



mens" milk meter. A tap permits taking samples for determining the fat content of the milk. Mechanical refrigeration, employing Freon as refrigerant which evaporates at 35° F (2° C), keeps the milk at low temperature. A 30-gallon (120 litres) water tank facilitates teat cup disinfection and hand cleaning. As the entire equipment is powered from the tractor engine, it does not depend on a power supply system for operation. Consequently, it is well suited for use on pastures.

Actual application has proved that mobile milking units as described are

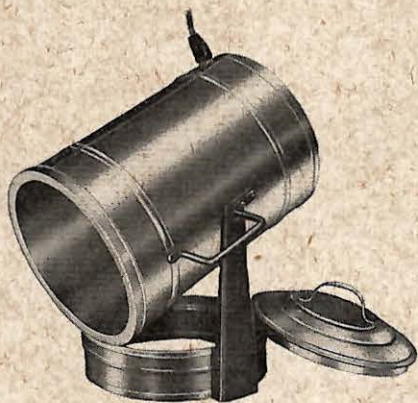
highly economical and effect great savings provided dairy farm cooperatives are properly organized.

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List of manufacturers mentioned:

- Eduard Ahlborn AG., Lüntzelstr. 22, Hildesheim
- Daimler-Benz AG., Werk Gaggenau, Gaggenau
- Gebr. Diessel, Altes Dorf 18/20, Hildesheim
- Ernst Göbel KG., Bregenzer Str. 15/17, Stuttgart-Feuerbach
- Hanomag AG., Postfach 268, Hannover-Linden
- F. Landwehr & Co., Maschinenfabrik, Isselhorst i. W.
- Miele & Cie., Maschinenfabrik, Bielefeld
- Westfalia Separator AG., Oelde i. W.

For quite some time already, progressive-minded farmers are using electric fodder steamers for the preparation of the fodder. In contrast to coal-heated stoves formerly used, these portable devices can be employed at any place, have the advantage that soot, smoke and dust are eliminated, that no attendance is required, that the operation is cleaner and more pleasant, and that it is not necessary any more to lift heavy loads. However, those large-size electric fodder steamers manufac-



"Weber" Electric Small-Type Fodder Steamer; a multi-purpose device for fodder steaming, laundry washing and canning

tured for capacities ranging from 100 to 300 liters (approx. 22 to 66 gals.) are exclusively suited for large farms.

Now, Herd- und Backofenfabrik Anton Weber has taken up the production of small-size electric fodder steamers in addition to the bigger models. This fodder steamer enables even small-cattle and poultry farmers as well as farms keeping just a few hogs to change to electric fodder steaming.

The small model, type 40 K, for approx. 20 kg (approx. 44 lbs.) sufficient for two pigs, has a power input of 1.5 kW; the larger model, type 80 K, for approx. 40 kg (approx. 88 lbs.) sufficient for 4 to 5 pigs, consumes 2 kW. The steaming time is approx. 1 1/4 or 2 hours respectively. When interposing a switch clock, these steamers may be operated with cheap night-rate current. The operating costs are lower than the expenses for wood or coal. Boiler and lid are double-walled, galvanized inside and outside, and well insulated. The boiler is supported in a sturdy tilting frame equipped with a

Electric Fodder Steamers

tilting lock, but it can be lifted from the tilting frame and used for fodder transportation, too. In addition, a washer inset has been designed for the two models, changing the steamer into a washing machine operating according to the gusher process. This process is especially easy on the laundry since it is neither moved to and fro or rubbed, but is permanently sprayed with boiling soap suds. In the course of this process, all the grime is dissolved and washed out. Any subsequent manual washing is not required. Boiling and washing of the laundry is performed in one operation and without any effort. The washer inset for the fodder steamer, type 40 K, has a capacity of 2 kg (approx. 4.5 lbs.) of dry laundry; and the inset for the steamer, type 80 K, a capacity of 4 kg (approx. 9 lbs.) of dry laundry.

In addition, the steamer may be used for the canning of foods. The smaller model has a capacity for 21 one-kg cans; the larger model for 30 one-kg cans.

6098 Zs.

(Anton Weber, Herd- und Backofenfabrik, Ettingen/Baden, Germany)