NEW WAYS OF PANEL BOARD PRODUCTION. PLANTS FOR MANUFACTURING PANEL BOARDS FROM HEMP SLIVER

By

J. Jakab

The replacement of wood as a basic raw material and its more economical utilization has become an increasingly grave problem all over the world. Every effort has been made to save this raw material availability, meeting ever growing difficulties, — and reproduction of which requires twenty to fifty years — for use in only those fields where it is irreplaceable. Wood is expected to become in the future much more the raw material of paper and chemical industries only. The furniture industry of which wood has been the classic raw material is changing to work up various sorts of cast wood, equivalent or better than wood. While wood for the classic processing methods of the furniture industry could be supplied with an efficiency of 30%, a yield of 70—80% can be secured for the different kinds of cast wood timber (such as chipboards, fibre slabs). It is even more advantageous to manufacture panel boards with the complete elimination of wood, employing flax and hemp sliver instead. This raw material of the stemfibre plants is reproduced each year. Search and consequent utilization of this new material has been necessitated by an incessantly increasing shortage of timber. This trend can be felt in all countries whether they abound in wood or not.

Some years ago a research work has been inaugurated in Hungary with the chief purpose to find a method of utilizing the hemp slivers originating from the digestion of hemp fibres in the production of panel boards. The immense quantity of the yearly regrowth of hemp sliver enabled the replacement of many hundred thousands of cubic metres of sawn wood.

The importance of manufacturing panel boards from hemp sliver has been increased by the fact that contrary to the classic panel boards — being strip boards or overlaid panel boards made from sawn wood — there is no danger of subsequent undulation and warping which trouble is due to the employing of different sorts of wood. Overlaid boards with hemp sliver panels suffer no undulating or warping. The furniture industry may thus employ quite new structural features when processing these panel boards, the setting down of edges does not require stiffening like in classic panel boards, and in addition working becomes more simple as well.

The advantage offered by the fact that overlaid boards with hemp sliver panels can be produced under Hungarian conditions 20% cheaper than any kind of the classic panel boards of about identical features cannot be overlooked. The chief reason is due to the fact that the raw material — the hemp sliver which can be considered as a waste — is very cheap, and its producing technology in comparison with the producing technology of the strip boards is considerable simpler and requires less labour.

On the basis of the said reasons, vigorous efforts were devoted to the development of the producing technology of panel boards made of hemp sliver, and to the design and manufacture of the machinery required for the purpose.

This research work and the experiments were successful and at the present time seve-

Table I

Technical data	DÉLROST	NOVOBAN	TRIANGEL	VERKOR
	Overlaid boards made with hemp sliver panel	Wood shavings	Wood shavings	Wood shavings
Average volume kg/cu. m.	651	660	620	600
Average bending strength kg/sq. m.	420	300	210	160
Average water absorption in 24 hours per cent	22.6	23	13	unknown
Average swelling in thickness after laying 24 hours in water	6.75	7	7.5	unknown
Resin per cent (dry substance)	6.5	unknown	unknown	unknown
Thickness of plate mm	22.27	21.51	19.07	19.2
Thickness of plywood mm	2×2	—	—	—

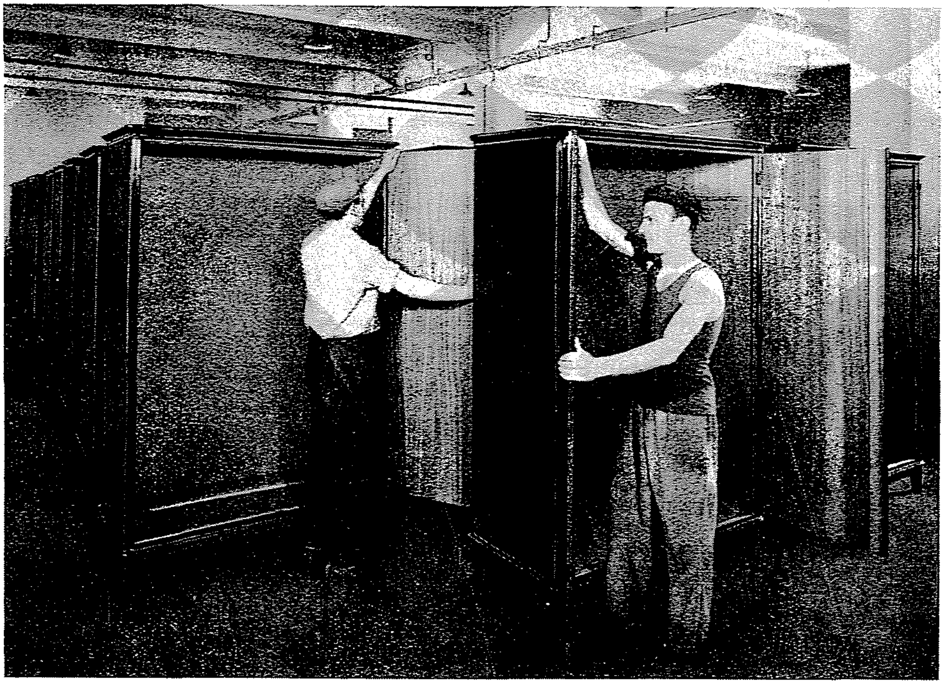


Fig. 1

ral factories are running — settled near fibre disclosing plants — and produce overlaid boards with hemp sliver panels. When comparing characteristic data of the more known panel boards with the overlaid boards made from hemp sliver, we get the values shown in Table 1.

The values of the table show that panel boards made from hemp sliver overlaid on both sides with a veneer of 2 mm thickness have much more better physical properties, than various sorts of cast wood. Boards overlaid with hemp sliver are primarily used in the furniture industry. The finished goods made from panel boards are illustrated in Fig. 1.

The wardrobes shown in the photograph are made from boards of hemp sliver with the exception of doors and back panels.

Panel board factories equipped with technological machinery made in Hungary become always more able to comply with the ever growing demands of the furniture industry.

Let us examine now some details of these plants for manufacturing panel boards.

When designing the plants it was of primary concern that their capacity should be in accordance with the capacity of modern plants which process the hare, since this is the source and supply of the required raw material, namely of the shove of peeled hemp.

Therefore we equipped our plants in general with a machinery capable of a yearly production of 6000 cubic meters of overlaid panel boards. We broke away from the practice of western firms of similar character though working with other raw materials, having a yearly capacity of 20,000—40,000 of cubic meters, yet we are in the position to offer factories which require comparatively small capital investment and which can completely be supplied with the necessary raw material by the fibre processing plant, thus the transport of the bulky sliver of small volume weight is unnecessary.

Plants of this type — along with storage facilities for the product — may be housed over an area of 2,500 square meters in existing, or new buildings of 17,500 air cubic meters.

An additional and considerable advantage is that instead of comparatively expensive transport the hemp sliver is conveyed from the place of origin by a cheap and modern pneumatic equipment to the plant producing panel boards. Another advantage which should not be overlooked is that these plants do not require separate boiler houses, as the steam produced in the fibre factory is generally sufficient to supply the heat requirement of the plants producing the panel boards from hemp sliver.

Usually also the necessary electric power can be secured by the energy source of the fibre plant. As an informative value, it can be stated that the production of 1 cubic meter of panel boards requires roughly 100 kWh of electric energy and about 1.2 tons of steam in such plants.

To illustrate the lay-out and arrangement of factories of this kind, Fig. 2 gives a photograph of the plant which produces panel-boards and is settled beside the Hemp Factory of Dunaföldvár.

When the capacity of the hemp factory is increased naturally there is no difficulty in a corresponding increase of the production of the plant manufacturing panel boards from the shove of hemp, to attain an annual production of 8,000 to 10,000 cu. m. of panel board; the enlargement requiring relatively small investment.

In the plant having a capacity of 6,000 cubic metres per year the technology of manufacturing panel boards is the following:

The shove of hemp produced on the technological units in the hemp fibre factory is collected, and forwarded by a pneumatic conveyor to a separating cyclone placed on the top of the building. Then by way of gravitation the sliver gets to a cylindrical screen placed under the cyclone. This is the place where the selection of the sliver particles of proper size suitable for manufacturing takes place, and the material is conveyed again by gravitation into a continuous cabinet drier of modern design which is found under the screen. The drying apparatus belongs to the best ones all over the world and requires only 1.2 kg of steam for evaporating 1 kg of water. The dry sliver having been prepared for the manufacturing process gets now in a feeder and then into a mixer where it is mixed with synthetic resin. The mixture is forwarded from here to automatical charging scales, whence appropriate portions of mixture for each board are passed on over the spreading former set to be found under the scales. The quilt which has been made on the spreading former comes now to a press feeding device set before the hot press, from which 7 spreadings are simultaneously forwarded by a pusher apparatus into the hydraulic hot press of 1,000 tons. Pressing

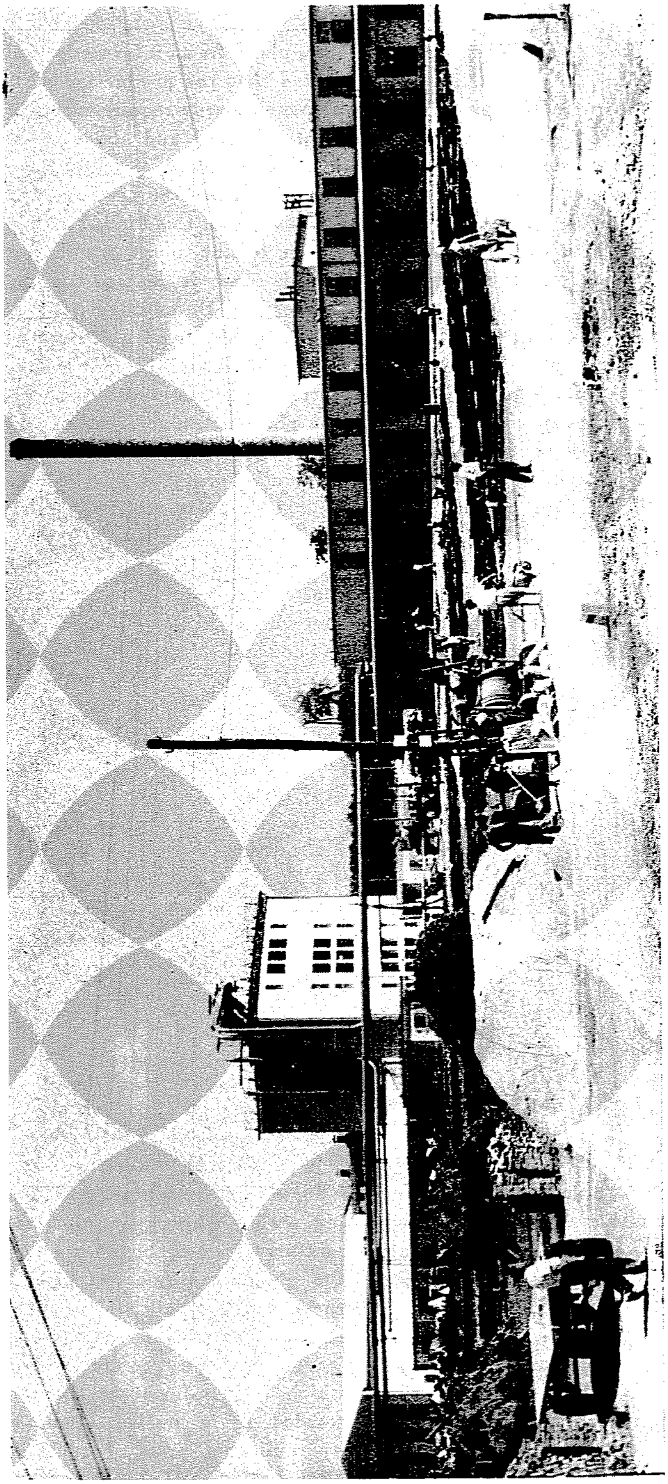


Fig. 2

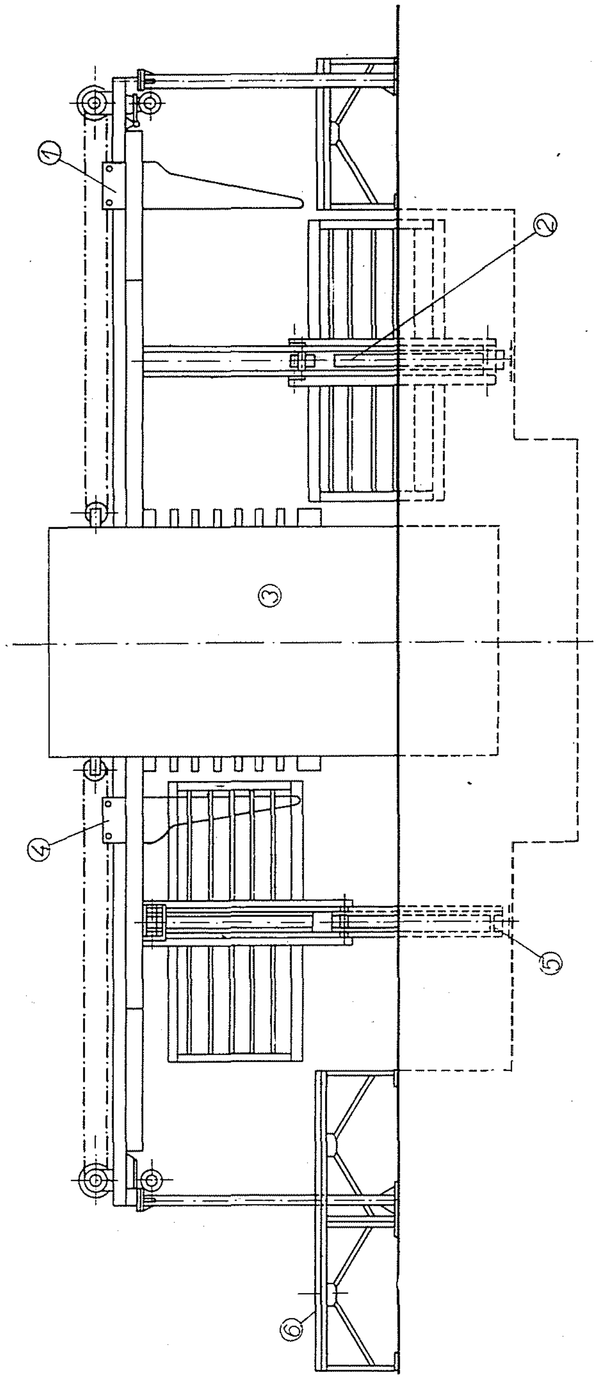


Fig. 3

and baking of the boards takes place in the hot press between heated plates under a specific pressure of 27 kg/sq. cm., at a temperature of 110—120° C.

During the prescribed time of baking the synthetic resin is condensed, and then the ing press is operated by a control table of suitable construction.

The way of storage is shown on the photograph in Fig. 4.

We succeeded in automatizing completely the most essential phase of the described

Fig. 4

core plate is ready. Subsequently the press is automatically opened, and a drawing mechanism pulls the seven finished core plates out of the press.

The core plates which come out of the press are put onto a trimmer saw where they are cut to the proper size, and then a polishing machine sets their measures of thickness. The plates of the right sizes are then coated with dressed synthetic resin mixture on a spreader, and then overlaid with prepared sheets of veneer. A press service mechanism passes on these prepared sheets into a five storied hot press of 300 tons, where the veneer is mounted on to the core plate at 70—90° under a pressure of 8 kg per sq. cm. Following the prescribed time of baking a drawing mechanism removes the ready boards. Also the production line of the veneer-

production of boards, i. e., the manufacturing of core plates. The whole working process, starting with the spreading and ending with the automatic removal of the baked core plates, is controlled by one man, the press controller. Fig. 4 shows the general arrangement of the production line. The press controller runs the production line by means of press buttons placed on the control table and checks its proper operation by the aid of the instruments built in there.

With the help of the recording instruments of pressure and temperature built also in the control table, the management is always in the position of checking subsequently the true pursuance of the prescribed technology, and secure the most economical conditions of production.

The machine units in Figure 3 are as fol-

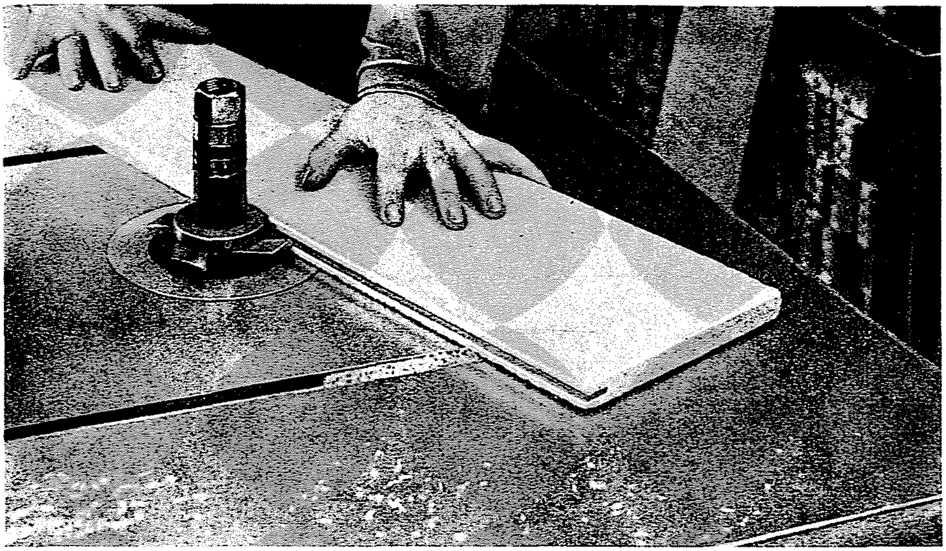


Fig. 5

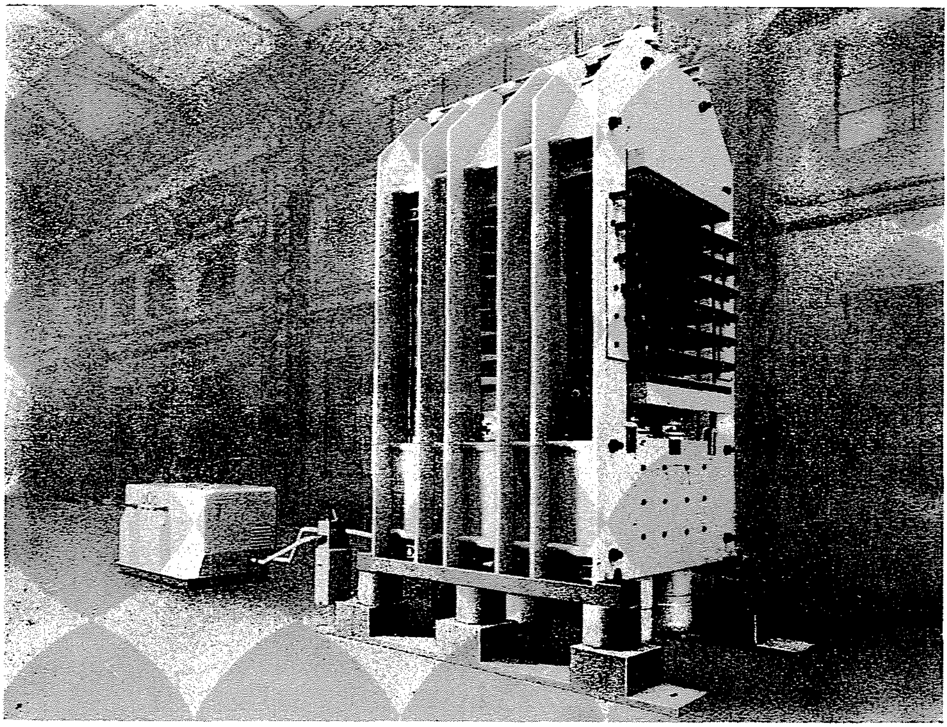


Fig. 6

lows: 1. Charging apparatus. 2. Hydraulic elevator, each compartment holding one spreading. When all the seven compartments are filled, the pusher apparatus forwards the spreadings into the open hot press. 3. Hot press, which presses the spreadings to obtain the desired size and condenses the synthetic resin component by the help of steam circulating in its heating plates. 4. Puller apparatus which pulls the seven finished core plates out of the hot press. 5. Hydraulic elevator which receives the seven core plates coming from the hot press. 6. Roller tables. to receive the finished core plates.

All boards — whether overlaid or simple core plates made from hemp sliver — which are produced in the above process of making panel boards can be worked like wood. The picture in Fig. 5 demonstrates how excellently even slot milling — one of the most tender operations — can be performed on panel boards from hemp sliver.

The yearly productivity of the described equipment is 70—100 cu. m. of ready panel boards per man. Taken into consideration that the plant can be operated mostly by instructed workers, this productivity appears to be a favourable value according to the international standards.

All machines required for the above described technological processes are manufactured by the Hungarian industry. Fig. 6 is a photograph of a seven-storied hotpress of 1,000 tons and of the pump unit belonging to the same. This press complex represents a basic machine for the whole production of panel boards. By means of this press complex it is possible to secure the shortest press-closing time prescribed by the technology, and besides to operate the apparatus with as little as 20 kWh instead of the energy requirements of 40—50 kWh as usual in the known art. This construction alone enabled to save 120 000 kWh of electric energy a year as compared with plants which work with the traditional machinery and equipment.

The installation of the continuous drying apparatus described in the above technological discussion is of similar importance. Compared with traditional drying equipments it saves about 1000 tons of steam per year.

A special feature to be seen on the photograph in Fig. 7 is again represented by spreading former unit operated from the control table. This equipment allows the forming of spreadings with weights of choice. The mixture of hemp sliver and synthetic resin which comes into the upper container will be passed at a rate controller from the control table to the automatic scales placed under the container. After having received the quantity corresponding to the weight of one portion of spreading adjusted on it previously the scales stop the feed automatically. By this feature the manufacture of panel boards of practically completely uniform volume weights could be realized.

As a result of endeavours of several years some practical possibilities have been found which apply the principle of unit construction elements; i. e., the most important basic machinery is manufactured in one given size and type, independently from the local conditions and from occasionally existing buildings, and only the types and sizes of the connecting parts are tailored according to the local requirements.

The described equipment has the great advantage of being suitable — though designed originally for the production of panel boards of hemp sliver — also for the manufacture of panel boards from flax sliver or even from other raw materials, such as bagasse, shavings, tobacco stems, etc. In case of changing the raw material it is only necessary to alter the screen and if necessary, a cheap desintegrator is to be used before starting the given technological process. A factory of this type was erected next to one of our large paper factories of the described type for utilizing the wood shavings and it is now producing panel boards of the best quality.

To sum up, this briefly described plant represents a new way of manufacturing panel boards, regarding the aspects of both economy and small capital investment.

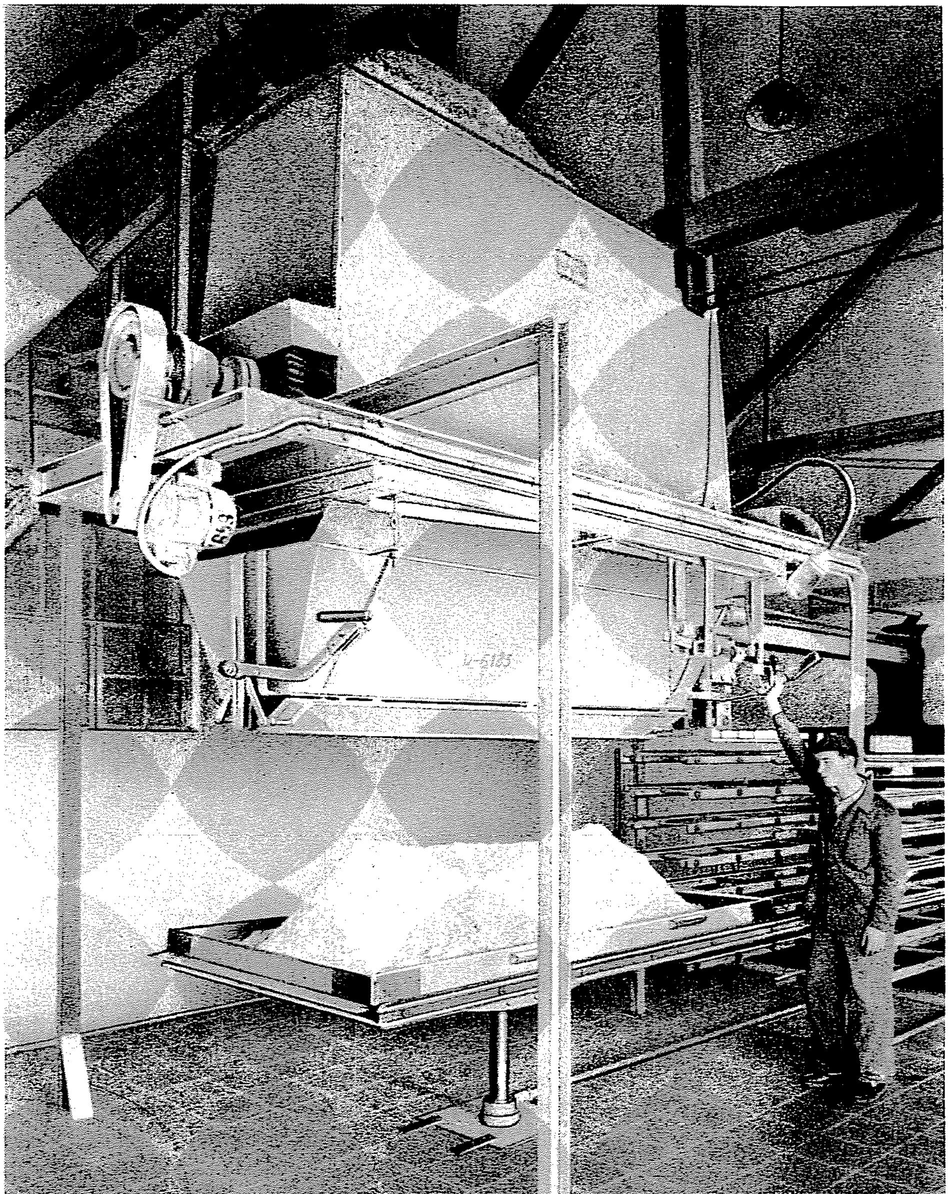


Fig. 7

THE DESIGNING OF STANDARD CANNING FACTORIES

By

A. Stanga

The various reports and statements issued by the Bureaus of Statistics in different countries reveal that both in countries where the population already attained high living standards and in areas under development being still backward from the industrial point of view, the supply by the food industry is by necessity on a continuous increase. Specialists dealing with the science of nutrition are engaged in a search for solutions adequate to this continuous per capita increase. An outstanding task is the preservation of easily digestible vegetables and high Vitamin fruit.

When endeavouring to settle the arising problems we intended to establish standard canning factories suited for the production of different kinds of preserved vegetables, ready-to-serve and semi finished dishes, canned fruit and juices, making due allowance to present time requirements.

The consumption of vegetables and fruit can be provided for generally in two different ways viz. by the supply of fresh food or of canned food processed according to methods best suited to the attributes of fresh food and retaining also the utmost vitamin content.

The most accomplished form of nutrition is beyond any doubt the supply of fresh food; this, however, cannot be realized everywhere and particularly not at any time. The supply of fresh food is based on adequate sources of raw material, on favourable climatic conditions, facilities for rapid transportation, cheap production and the possibility for the goods to reach the network of commerce quickly and smoothly. This task, however, can be fully accomplished in very few places only, partly because of the climate, partly on account of the great distances to the sources of raw material, also as a consequence of difficulties arising in transportation. Besides these "traditional" causes, in our days the supply of food to the population is much influenced by the fact that women obtain an ever increasing function in industrial production so the provision of fresh food and its preparation encounters increasing difficulties.

The uniform distribution of fresh vegetable and fruit all over the year is even in the most favourable climatic conditions hindered by the geographical facts. This is why in countries where the level of the consumption of fresh food is already comparatively high, as a result of the increasing living standards and of higher intensity of intellectual work, and last but not least, of changed tastes and demands, the consumption of various and manifold preserved food of vegetable origin — with a parallel further growth of fresh food consumption — is thrust more and more into prominence. This problem becomes still more topical where the raw material sources, the unfavourable climatic conditions and difficulties of transportation do not permit at all or only for a very short period the consumption of fresh food of vegetable origin. These areas almost wholly depend on the consumption of preserved food. Under such conditions the outstanding quality of these goods, their highest possible Vitamin content and also the consumer's prices obtain a decisive importance. It clearly follows from what has been said above, that the canning industry has to cope with more and more difficult tasks including the foundation of new factories in places where there was never question of this, partly for economic, partly for technical reasons. Mechanization of agriculture, irrigation, adequate and increased soil nutrition opened new prospects for the production of vegetable raw material of the canning industry, that in the past could not be realized even with most intensive work in agriculture.

A further aspect of the problem that should not be neglected is the fact that the population of these agricultural areas may supply for the demand of labour in the canning industry. Consequently it seems advisable to utilize these favourable potentialities in the most economic way.

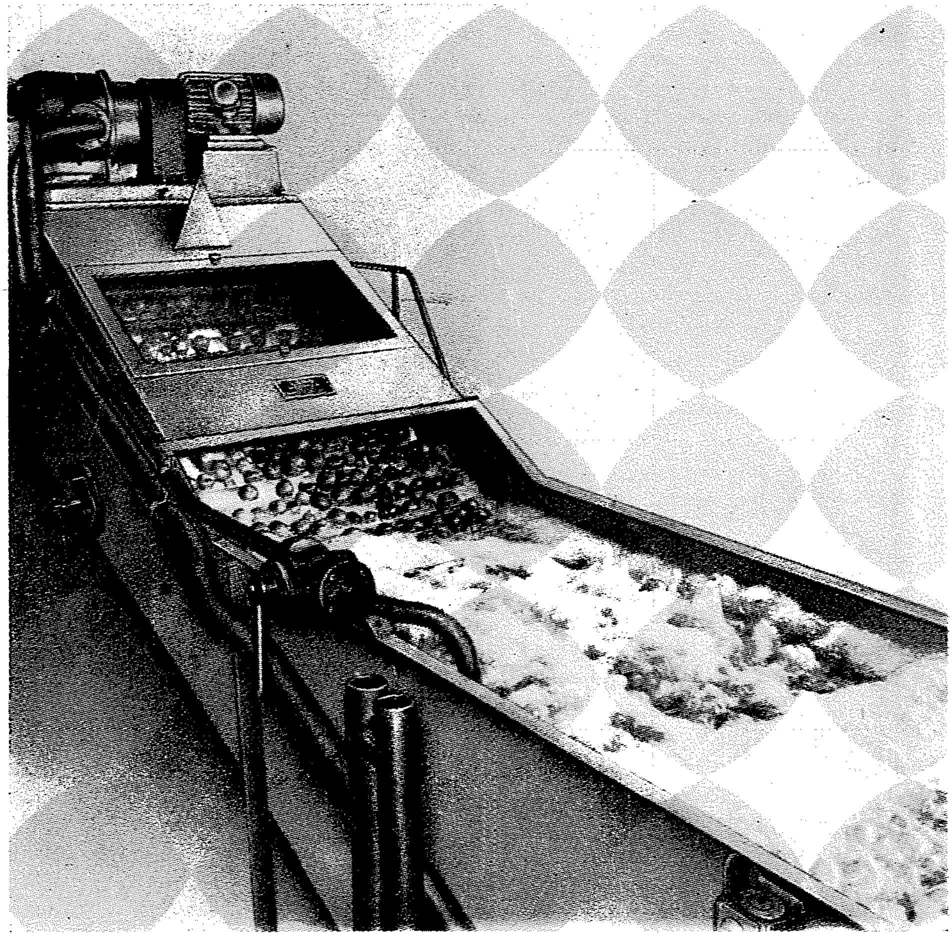


Fig. 1

Thus the question arises as to what economic considerations should prevail when establishing a new canning factory. In our opinion the problems involved should be investigated and settled under the following aspects.

1. A favourable source of raw material must be found which beyond local supply can provide also for more distant areas to be supplied economically with a variety of preserved food.

2. The possibilities for the transportation of raw material should be examined, the ripening period of the several crops determined and possible overlappings stated.

3. Yields of several raw materials have to be investigated.

4. After having unequivocally settled these tasks a schedule should be fixed for the production of the factory and the products to be dealt with are to be chosen.

5. It has to be examined how the new factory could be supplied with ingredients needed for production, particularly with sugar, spices and condiments.

6. It has to be found out whether jars or tins are more economic to use for packing and accordingly the packing methods must be determined.

7. Storage requirements as well as the order of operations to be carried out and conveyance of materials in the warehouse should be fixed.

8. Provision must be made for a network of roads necessary for transportation and for a side-track to be established.

9. The basic condition for the economic operation of the factory is the supply with energy at lowest possible costs.

a) a boilerhouse suited for the production of steam has to be designed and suitable fuel is to be provided for;

b) possibilities of connecting the factory with the electric network or possibly the establishment of an own electric station (Diesel aggregate) have to be studied;

c) as to the drinking and industrial water supply it has to be examined whether connection with an existing water conduit or establishment of own wells or the possible utilization of the water of a river or lake seems to be preferable. Waters must be analyzed;

d) the question must be studied whether the plant can be connected with an existing drainage and if this is not possible, how the sewage and waste waters can be drained off;

e) when all these preliminary conditions are settled in conformity with the requirements pertaining to the establishment of a new factory, the directions have to be fixed for the connection of power lines outside the factory.

10. Provision should be made for the storage of raw material and for a suitable packing room.

11. Prescriptions made by the authorities concerning sanitary requirements should be thoroughly studied both as regards the protection of the workers and as related to products.

12. When establishing a new factory, not only the source of raw material is of high importance but also the problem of manpower must be dealt with. When planning for mechanization of the plant the qualities and skill of the workmen must be reckoned with and workers who have not been acquainted yet with machines have to be gradually trained for the operation of equipment possibly including more complicated automatic devices or instruments. Thus it is advisable to establish a high degree of mechanization only when the specialists needed for this kind of work are already available and have obtained the necessary education and vocational training. It is, however, desirable to provide for space for future establishment of this machinery right from the outset.

13. The interior traffic of the factory, the conveyance of materials, the path of the finished products and the transportation of the packing material to the premises where filling in jars or cans takes place should be devised, avoiding crossings if possible.

14. The place for the storage of jars should be designed in compliance with transportation facilities.

15. Number and size (dimensions) of jars to be washed must be established.

16. Climatic conditions of the locality where the factory is to be established should be studied including highest and lowest temperature to be expected, number and distribution throughout the year of rainy

and rainless days, also air humidity where this is of importance.

17. Tasks concerning heating and ventilation should be established and the question decided whether central or individual ventilation equipment seem to be more expedient.

Fig. 2

18. It must be decided whether a refrigerating installation should be constructed for the raw material and fruit juice storage rooms or warehouses. If this is the case, the temperatures to be obtained by cooling must be established in the various rooms.

19. Provision should be made for a repair and maintenance shop equipped with the machines necessary to enable this unit to cope with minor obstacles and accidents possibly arising in the production period.

20. It is expedient to carry out adequate geodesic measurements in the premises in order to establish the quality of the soil, the water level and the possibilities for the construction of a cellar or to decide for a plant without cellar whether it proves to be economically sounder.

On the evidence of these data it may be found out whether or not it is possible and economically advisable to establish a new canning factory in the area. Once this question is decided method of preservation must be decided. According to the various technological requirements the same raw material can be preserved in different ways. In to-days practice the processing by conservation of raw materials of vegetable origin is provided for according to 3 main methods.

1. The most widespread preservation method is the conservation in jars or cans with heat treatment, by souring or in syrups of high concentration. The advantage of this method is that when the technological prescriptions are observed, all kinds of raw materials can be processed and preserved. Storage and transportation according to this method do not raise comparatively high requirements as to temperature, so this method is generally given preference as against other processes of preservation. Its great disadvantage consists in the fact that packing materials available at present are very expensive and their storage as well as that of the finished products calls for large surfaces.

2. Preservation of food by quick-freezing rapidly gains ground and particularly enters into prominence where the possibility exists to build up adequate refrigeration chains between industry and trade. This system has the great advantage that the raw material most completely retains its original colour, nutritive value, vitamin content and aroma. Disadvantages connected with the method consist in the need of cooled storage area for the finished product and of transportation facilities equipped with cooling system. A further disadvantage is presented by the fact that an important part of vegetable raw material is not qualified yet to quick freezing at the present state of technology on account of their cell system and high water content.

3. Preservation of fruit and vegetable by drying (dehydration) is also very widespread. The advantages of this method consist in the low requirements for storage surfaces, inexpensive packing and easy transportation. Its disadvantage is that some raw materials are not apt to be dried and that desiccation is connected with comparatively high losses of aroma.

When planning factories to be exported the above described problems had been taken into consideration and a whole family of standard factories were developed with mechanization corresponding to the various regions and existing production capacities. In these factories packing in both jars and cans has been envisaged. Up to now six types of canning factories were developed for the procession of various vegetable raw materials. The capacity of these factories was established on basis of the finished product to be packed in standard jars of 0.5 liter each, assuming a producton season of 180 days and operation in two shifts daily. No standard designs were elaborated as yet for higher capacities the production "scope" of such factories being very diversified, different requirements arise in each case; various lines of processing have been evolved, however, also for such higher capacities.

Hungarian industry supplies at present six kinds of standard canneries. The preserving factory K-II, the most simple type with a capacity of 4,500 tons should be mentioned at the first place. Raw material to be processed consists partly of vegetables, partly of different fruits. The factory is meant for areas where agricultural production is in development now and the local workers have not been occupied in factories as yet. In view of these circumstances the mechanization in these factories is simple and most operations are carried out either with individual machines or on tables with manual labour. The plant is something of a great kitchen where tomato puree from 1,000 kg raw material per hour represents the only processing line. The factory is equipped, however, with modern washers, cleaners, selectors, fruit slicing machines, fruit steamer, triturating machines, scourers, duplicators, automatic jar rinsing machines and centrally controlled autoclaves; conveyance of materials is carried out by overhead transporters. Adequate storeroom, bureau, dressing room and bathing accommodation is available to the workers in the factory. A coal firing boiler unit and a Diesel motor generator set are allocated in a separate building. As a variation of this

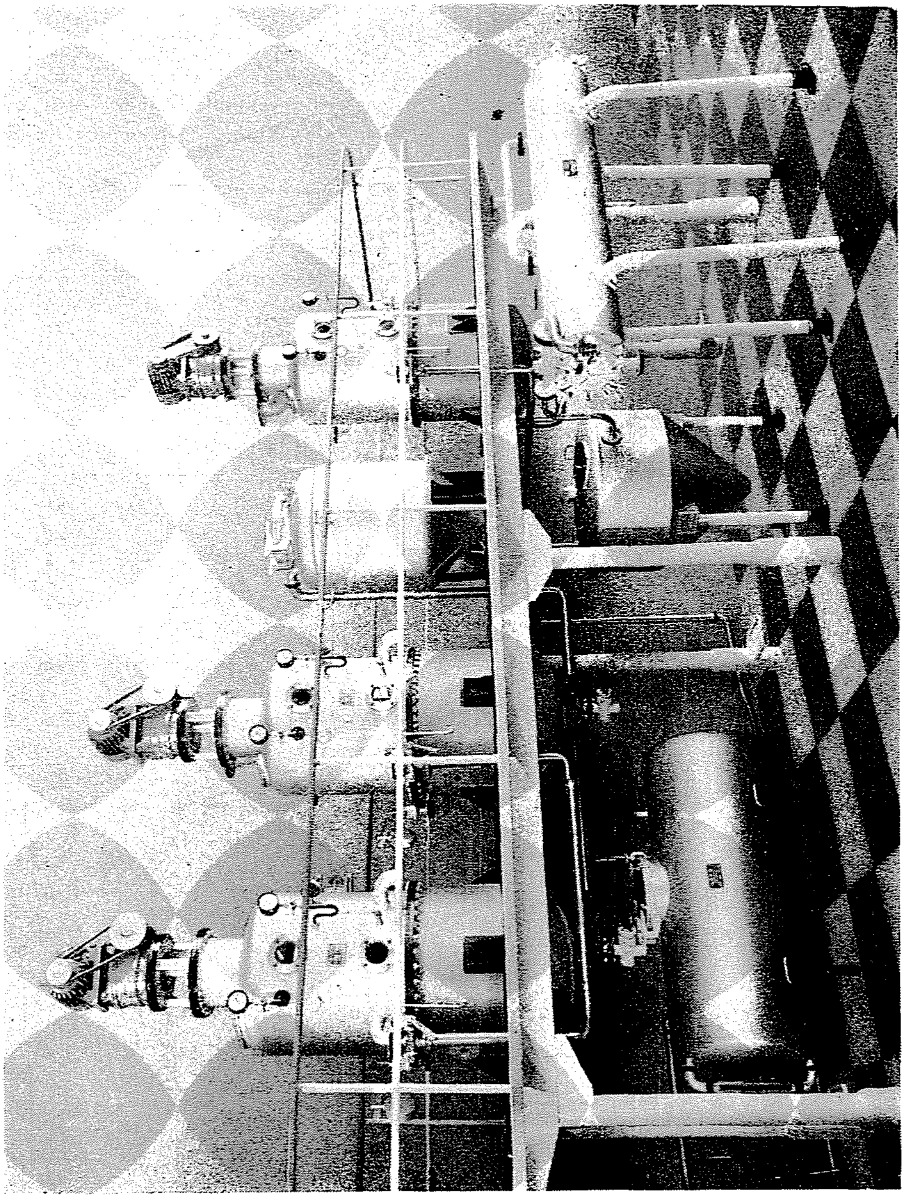


Fig. 3

design a transformator station may be supplied. A mechanized maintenance workshop is planned for maintenance.

The capacity of the other standard factories amounts to about 10,000 tons yearly. All these contain as a basis the technological equipment of the standard cannery K-II supplemented with different production lines according to the character of the region.

The canning factory K-IV is supplemented with a green pea line for processing 1,200 kg kernels per hour and with a threshing machine station to fit in.

The K-V cannery contains a purée processing equipment with a capacity of 3,000 kg raw material per hour and facilities for the production of tomato juice.

The canning factory K-VII is equipped with facilities to produce various prepared (cooked) food and "lecsó" (a Hungarian dish made of stewed onions, tomatoes and paprika) and with a cucumber line of 400 to 800 kg production per hour.

There is no tomato processing line in this canning factory but the prepared food and tin fruit lines are reinforced. Facilities for the processing of mushrooms and cucumber are foreseen.

The latter three factories are equipped with cooled raw material store room adjusted to 0° C and −12° C respectively.

All types are provided with power supply equipments adapted to the capacity. Water suply, however, has to be realized in each type according to locally afforded possibilities.

It might be useful to give a more detailed description of the standard canning factory K-VI, a type particularly preferred by customers. From these details with the corresponding transpositions a conclusion may be drawn as to the degree of mechanization in the other types listed above.

In this standard factory the customer intends to produce the following goods:

a) tomato pure out of 3,000 kg raw material per hour;

b) various shining and fibrous fruit juices out of 600 to 800 kg raw material per hour;

c) various canned fruit, out of 1,500 kg raw material per hour;

d) various jams, marmelades and fruit sauces out of 1,000 kg raw material per hour;

e) preserves of the "lecsó" type from 200 kg paprika per hour;

f) vegetables in natural condition from 1,000 kg raw material per hour consisting of tomato, red cabbage, beetroots and carrots;

g) prepared vegetable dishes, such as stuffed paprika, zakushki, from about 1,000 kg raw material per hour.

For the several localities of the building a suggestion was submitted to the customer. The task was to arrange in this building the best technological equipment suitable for the processing as outlined above. Due allowance was made to connections, to the several points of junction and to the principle that crossings should be avoided as far as possible.

The building is constructed from precast concrete elements with column grids of 6 × 6 m unsupported length. The width of the building is 30 m while the length may be fixed according to demands.

The building includes the following main premises:

1. refrigerated chambers at 0° and — 12° C, area:	about	144 sq. m.
2. covered foreground (for taking over the goods)	,,	288 sq. m.
3. closed premises for preparatory processes	,,	216 sq. m.
4. processing premises	,,	1,008 sq. m.
5. premises for the rinsing of jars	,,	144 sq. m.
6. store rooms	,,	864 sq. m.
7. premises for labour hygiene etc.	,,	396 sq. m.
Total area		3,060 sq. m.

The lowest headroom of the building is 4 m, the central 6 m column grid over the whole processing division in a total length of 54 m being elevated. The highest headroom of this part is 8 m, corresponding to the dimension required for the condensing machine.

The covered foreground serves for taking delivery and storing of the goods as well as for the juice production department of the tomato line. It is immediately connected with

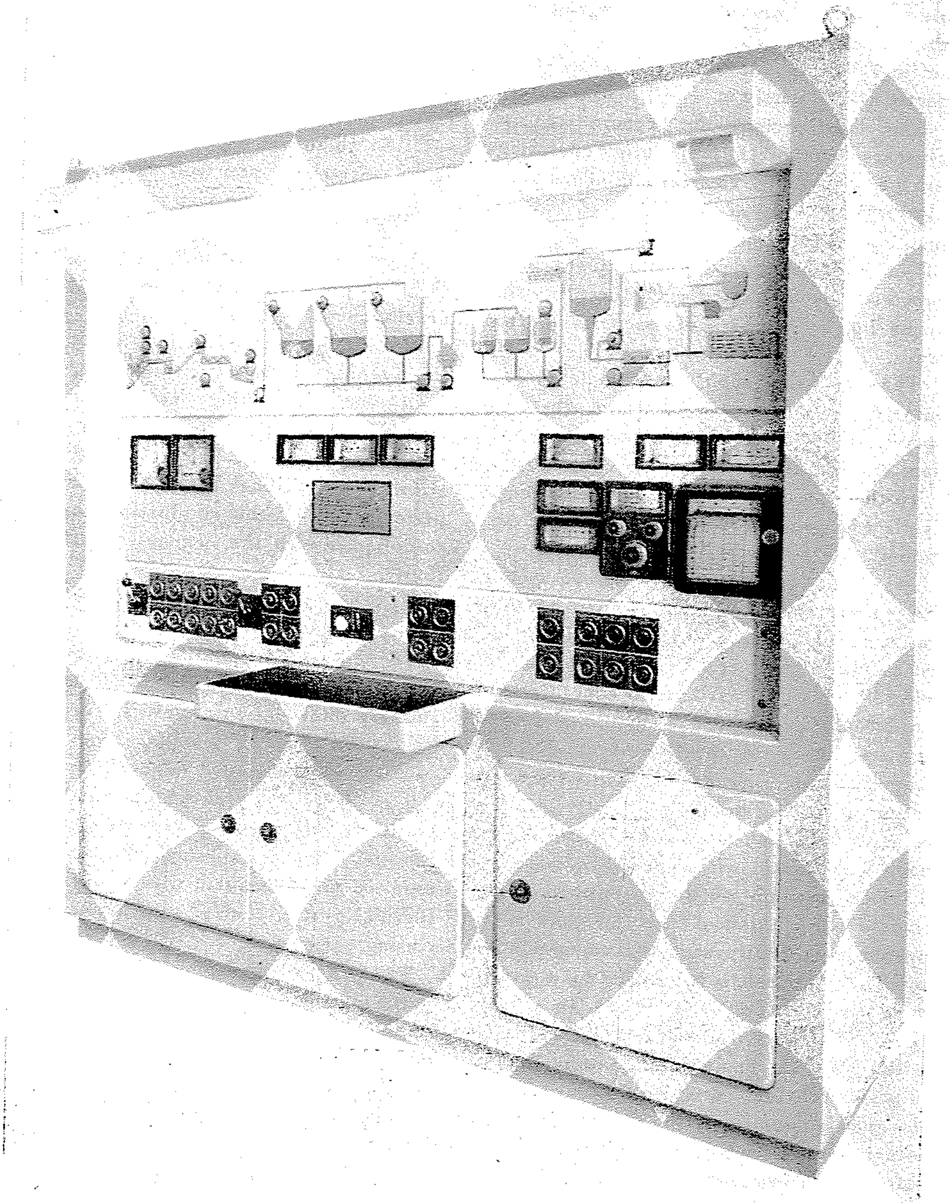


Fig. 4

the refrigerated chambers and with the closed premises for preparatory processes.

The cold storage brine freezing chambers are isolated and provided with foreground. In these chambers an amount of raw material sufficient for about 3 days can be stored partly at 0° C partly at −12° C if necessary.

The closed premises for preparatory processes are meant for the preparatory operations prior to processing, viz. washing of fruit and vegetable, removal of the stumps of paprika, and in a separated part cleaning and washing of onions. The premises for preparatory processes are connected with the processing room by a number of openings on the walls.

The processing room is a single hall of large dimensions where fruit and other raw materials are selected, processed, filled in jars or cans and sterilized.

In these premises the following equipment is placed according to the wishes of the customer:

A) A tomato processing line of system Láng for the processing of 2,000 to 3,000 kg raw tomatoes per hour. On this line 28—30 per cent tomato purée or, for the production of "lecsó", a 15 per cent tomato concentrate is produced. The juice production unit of this line is placed under the closed foreground wherefrom the crude juice is pumped into the triturating machine and subsequently into the concentrator. The latter consists of a preliminary concentrator with external radiator and 3 globe vacuum final concentrators. The tomato purée obtained from the globe vacuum pans is sucked by means of a vacuum into a receiver wherefrom it is pumped by a piston-type pump in the filling station. In view of the small quantity and due to the fact that with this equipment condensation can be only intermittent, no pipe-pasteurizer was designed subsequently to the receiver. By establishing a further preliminary condensator the performance of the tomato line may be increased to the processing of about 5 tons of raw material.

B) For the processing of fruit juices a complete U-1 type line has been established which is adapted to the production of fibrous juices. Since it is the customer's wish to provide for a possibility to process apple juices and particularly for a shining juice, a packing press suited for the production of 1,000 kg juice per hour was also established. The capacity of the fruit juice line is about 1,200 l fruit juice per hour, which as related to raw material is equal to 1,400—2,000 kg.

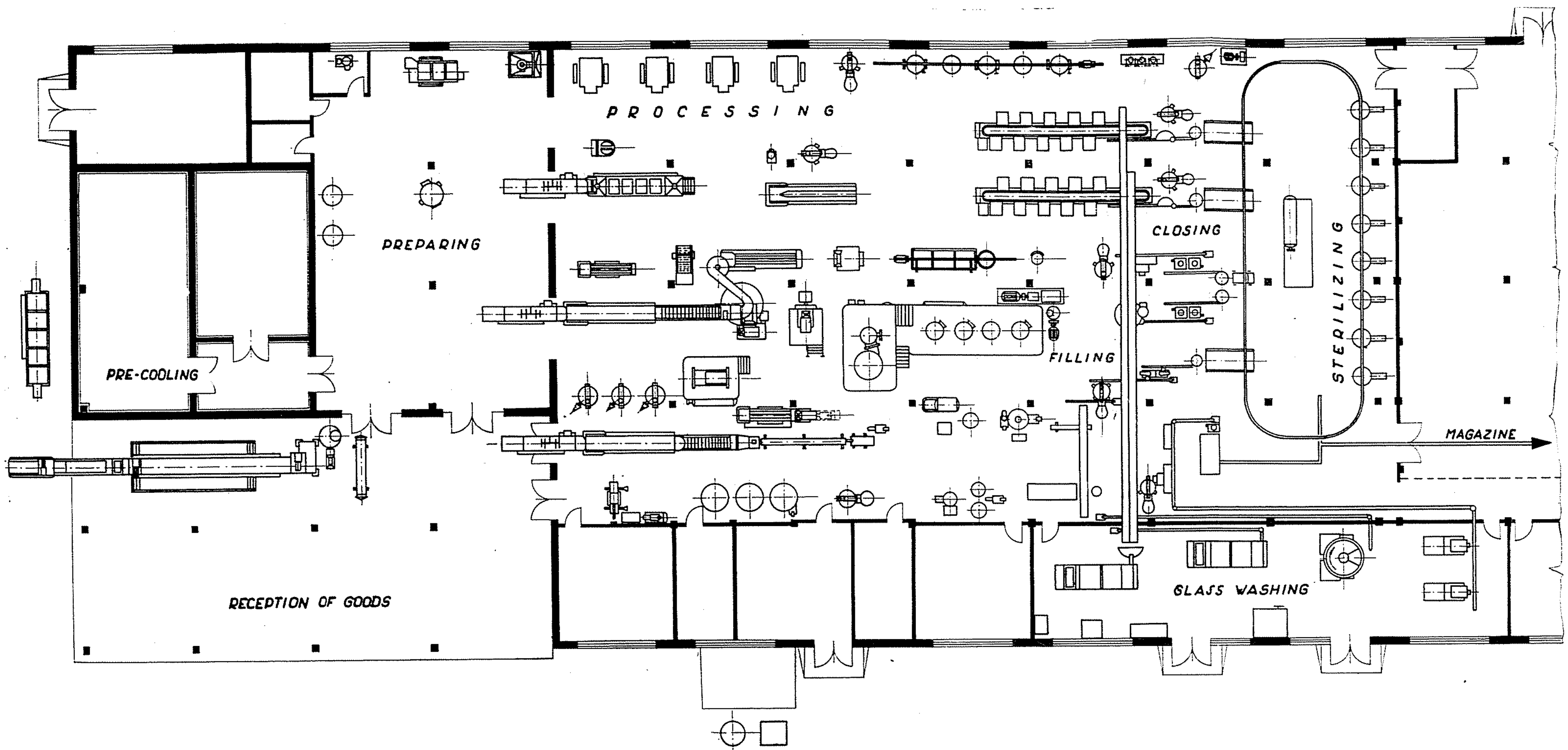
C) So as to process various tinned fruit, jams, marmelades and fruit sauces machines produced by the Hungarian machine industry and generally used in this country had been designed. Several machines have been modified, however, according to technological development.

In these lines of production, in addition to the washing and selecting machines, morello (sour cherry) stoning, grading, peduncle stripping, apricot halving equipments, scourers, apple slice cutters, disk steamers and triturating machines were established. The performance of the production line is in compliance with the demands of the customer.

D) The production lines of the several vegetable and prepared food production can not be separated from each other. The fittings are applied according to local conditions and seasonal potentialities. In compliance with this principle duplicators, cooling vats frying ovens, blanching devices, filling tables with circulation and closing machines with a performance adapted to the capacity were established. The processing unit is supplemented with electric centre, thermal centre, central ventilation, and jar rinsing premises.

Two band jar-rinsing machines are arranged in the jar rinsing premises with a performance of 1,200 jars per hour each, for the washing of half litre jars, further 1 washing machine with a performance of 2,000 per hour for the washing of 0.2 and 0.5 litre bottles and 1 litre jars, and 2 non-automatic washing machines for 3 litre jars. A soaking machine for the cleaning of very dirty jars has been also established. A new fitting is the device for the sterilization of the lids.

The technological planning of the processing unit succeeded in bringing all filling


PROCESSING
PREPARING
PRE-COOLING
CLOSING
FILLING
STERILIZING
MAGAZINE
RECEPTION OF GOODS
GLASS WASHING

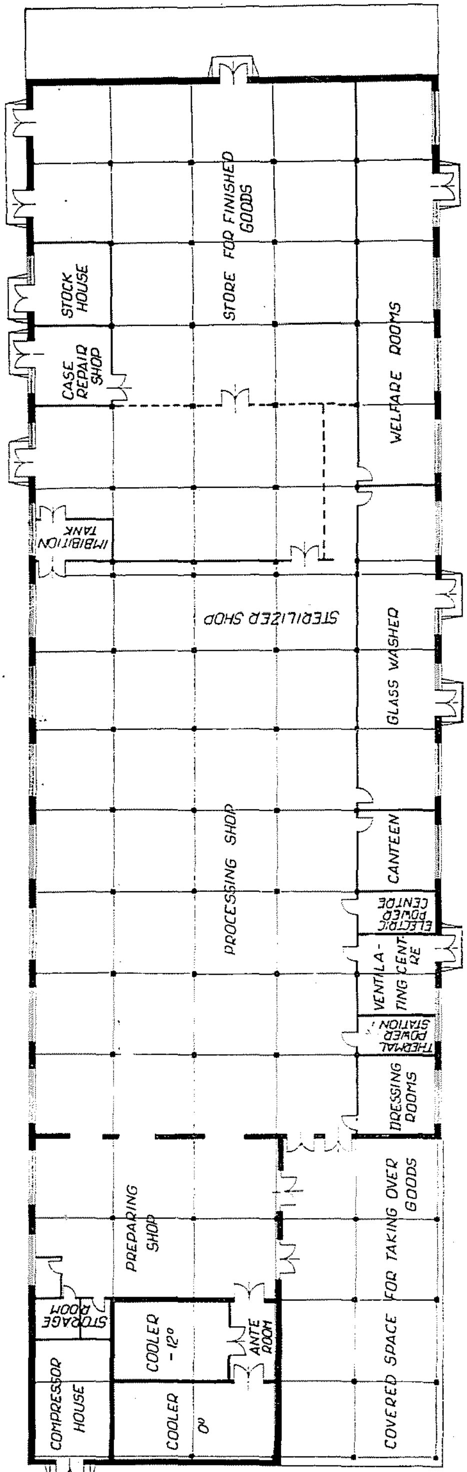

STORE FOR FINISHED GOODS
STOCK HOUSE
CASE REPAIR SHOP
WELFARE ROOMS
IMBIBITION TANK
STERILIZER SHOP
GLASS WASHER
PROCESSING SHOP
CANTEEN
ELECTRIC POWER CENTRE
VENTILA-TING CENTRE
THERMAL POWER STATION
DRESSING ROOMS
PREPARING SHOP
STORAGE ROOM
COOLER -12°
ANTE ROOM
COMPRESSOR HOUSE
COOLER 0°
COVERED SPACE FOR TAKING OVER GOODS

Fig. 5

places in one line. Thus the filling places are continually supplied with jars from the rins ing equipment by the aid of a high conveyor, while crossings are avoided.

The closed jars are placed in autoclave baskets and transported by the aid of a crab travelling on circular rails into the autoclave sterilizers. These are controlled from a central manipulating panel.

The sterilizing chamber is in direct connection with the magazine.

Power supply

For the standard canning factory K-VI a boiler house adapted to the production of about 9,000 kgs per hour of steam was designed, to which a Diesel unit for the supply of electric power is attached. Standard transformer houses are planned, when main current is available. The water-supply of the factory is provided for by means of hydroglobuses (automatic water tower).

HUNGARIAN POULTRY PROCESSING

By

G. SALAMON

A comparison of international statistical data on food consumption reveals that poultry among meats has in all countries come more and more into the foreground, and particularly so since the second world war. Besides the excellent taste of poultry, and the manifold possibilities of its preparation as a dish, there are also other reasons of economical nature to account for the increased consumption. An examination of the most important causes shows that poultry raising by the aid of mechanical incubators and breeders can be done very economically. Fodder is comparatively cheap, and the time from hatching till the poultry is full-grown and ready for kitchen is very short compared with other animals raised for their meat. A large number of birds can be raised on a small area. Furthermore, even more important is the fact that from hatching till turning out the poultry ready for kitchen, all operations for mass processing can be mechanized in a cheap and practical way. In addition it should be also considered that at the same time useful by-products such as eggs, and especially in the case of geese and ducks valuable feather are obtained.

For many years poultry has become by virtue of its excellent quality an important article of export to Hungary. Because of this considerable export, the Hungarian poultry industry had to solve the mechanization of all operations in a way to secure best first-class processing.

On the basis of experiments and experiences collected through many years, experts of the Hungarian poultry industry developed the mechanization of poultry processing. This new technology rendered poultry processing possible without any spoiling of the quality of the goods. At the same time the method of mechanization assures the economy of mass production too. During the design and construction of the equipment and machinery, vigorous efforts were devoted to achieve maximum possible automatization and to secure at any rate the hygienic conditions so important in the food industry.

At present in Hungary the mechanization of hatching, rearing, slaughtering, plucking including evisceration — and cutting of kitchen-ready poultry, including also the processing of feather is solved. These facilities are completed with a specially designed fore-cooling apparatus, a freezer and a refrigerating store.

On the basis of experiences obtained in Hungary, production of poultry processing equipment for export has been started in 1957. Since that time we have exported about 500 plants for poultry processing together with their refrigerating units to various countries. Continuous technical development resulted in the production of more and more modern equipments every year, which include many new patented machines, invented by Hungarian experts.

The central part of the poultry processing plant is the slaughtering and plucking equipment. Other operations taking place before the plucking are performed after it and are to be regarded as supplementary processing.

The picture and drawing show the equipment and arrangement of the type SB 602/I suitable for processing 500—600 chickens per hour. After being classified according to species and size, the poultry are carried to the spot, i. e. in wheel-mounted coops. The received poultry will now be hanged up to an upper rail running continuously with infinitely variable speed (*A*). For the sake of good processing it is useful to allow the poultry to be conveyed hanging on the upper rail for a few seconds so that excitement due to transport and hanging may subside, thus promoting further processing, primarily complete bleeding considerably. Riding on the upper track, after relaxing, the head of poultry gets into a special automatic electric stunning machine (1) which assures a narcosis before the processing is started. This stunning machine works with low voltage (utmost 2×45 V) the value of which can be adjusted by a switch. Furthermore, the number of contact lamellae under voltage can be regulated during the processing, which in turn will determine the length of stunning time in function of the speed of the upper track.

Besides the advantage of operating at low voltage, this machine assures uniform stunning if the poultry has been correctly selected before processing. The stunned poultry will be forwarded hereupon into the course of processing, the first operation of which consists of the plucking of the big feathers on the wings and on the tail by means of a special tail-feather and flight-feather plucking machine provided with rubber rolls (2). It is very advantageous to perform this operation right after stunning, since the feathers which can be plucked otherwise only with difficulty are removed easily under the effect of stunning and the birds feel nothing. Next comes the slaughtering and bleeding of poultry in a bleeding bath of closed system (3), then follows a bath of pouring with boiling water in strong circulation (4) for loosening up the feathers. The next stages are an automatic fore-plucker (5), automatic heads scalding machine (6), head plucker (7), an automatic finishing plucker (8) and automatic knee plucker (9), which successively perform the necessary plucking operations, without damage. Hereupon only the removal of the short feathers remaining on the wing ends is necessary, which is done in a machine for this purpose (10). Next operation is the eviscerating by means of a vacuum eviscerating epuipment patented in Hungary (11). This machine assures the mechanized removal of bowels in a hygienic way and without any injury to the internal noble organs. The previous mechanical removal of bowels considerably increases the possibility of hygienic processing when other interior organs are removed.

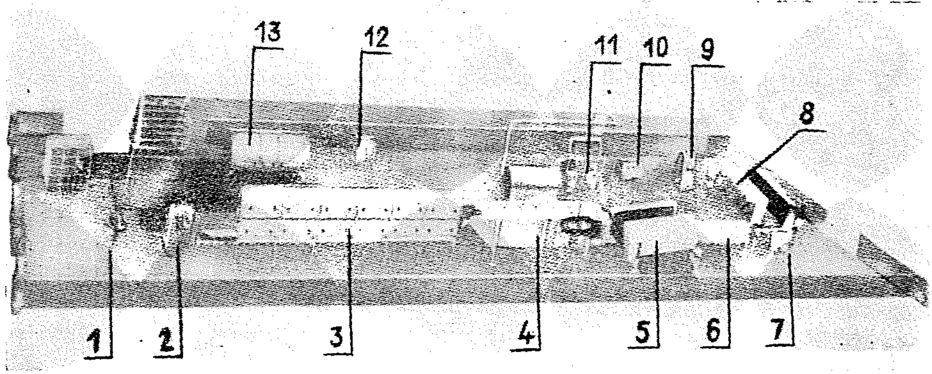


Fig. 1

Should any feathers have remained on the body of the bird, they can be removed very easily by manual labour. After having finished these procedures, an automatic singeing

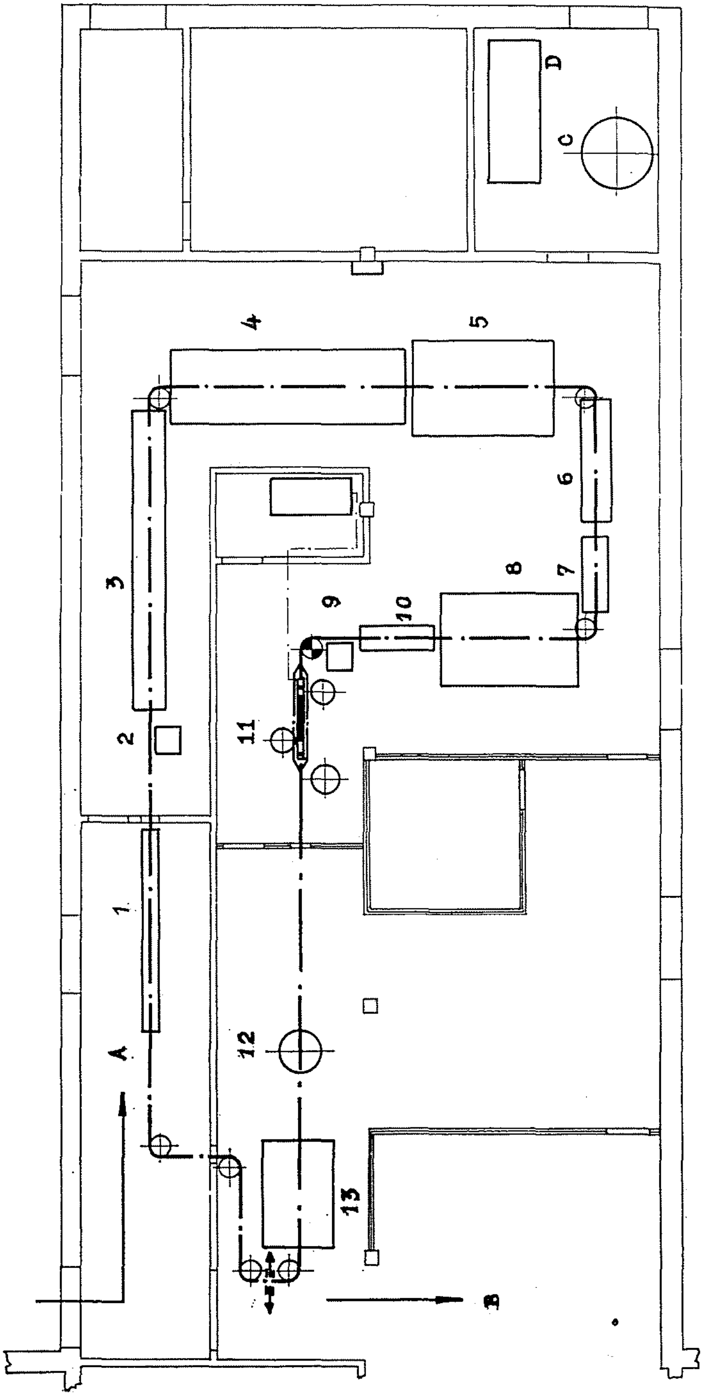


Fig. 2

machine (12) removes the fine hair from the body of the animal, which comes then into an automatic washer to be cleaned from the spots of dirt, if any, and a rubber lash whips it dry. At the end of this process the so-called soup poultry is ready in plucked and eviscerated state; it is off from the upper track (*B*) with the purpose of further processing, or refrigerating, and transportation, respectively.

Wet feathers obtained above come first into a centrifuge (*C*), and then into a drying drum with heating jacket (*D*) for further processing.

It is possible to complete the equipment if required with a device for the evisceration of the birds to produce the so-called ready-to-fry poultry. In the course of eviscerating, internal noble organs will be taken out and cleaned, this process being rendered much easier by the fact that the entrails had been removed previously by machine. During the same working process the cutting off of the head, neck, and feet are performed. After having removed these parts as well as the internal organs, the poultry are suitable for frying, and together with the cleaned internal organs or without them they can be put to market in vacuum-sealed plastic packings.

A further completion with the so-called parcelling equipment is very practical: this Hungarian system renders possible further processing to produce vacuum-sealed packages of the separate parts of the animals cut and sorted as requested.

The equipment discussed above is only one of the available types of machinery which can be furnished; plants characterized by similar technological principles but having different capacity are manufactured as well.

Naturally, if an increased production of the processing apparatus is desired, the number of the individual machines in the production line must be increased, and some of them must be of higher productive efficiency.

Anotherapparatus is suitable for duck and goose processing. In the technology for processing ducks and geese, steam is used instead of hot water for loosening the feathers. Routine has shown that this kind of treatment is the most efficient in plucking water fowl. Geese and ducks for roasting will be processed in a special way by dipping them in wax. However this practice is quite unnecessary with fat poultry.

In the process of plucking water fowl at present several operations have been mechanized without damaging the body. In processing water fowl the apparatus of feather processing is very important, for it performs total cleaning and a satisfactory classing of the feathers.

Some special machines are particularly suitable for modernizing old existing equipment; especially the vacuum disemboweler, the automatic head and knee plucker are succesfully used in many countries, among others in France. Complying with today's requirements it is useful to adopt a stunning machine as well.

The modern equipment improves the economy of poultry processing primarily by the fact that their use permits greater production with less manpower.