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TECHNICAL COMMITTEE · COMITE DES TECHNICIENS

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ARRANGEMENTS TO INCREASE SEASONAL DISPATCH CAPACITY ESPECIALLY BY FORK-TRUCKS.

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Superphosphate and fertilizers containing superphosphate, pulverized and granulated must generally be stored some time before packing with regard to the durability of the sacks. As a rule sackfilling in the factory takes place in direct connection with the dispatch and it is not usual that bagged superphosphate is stored in any appreciable quantity by the manufacturer. Therefore great demands are made upon the arrangements for the bagfilling, owing to the fact that the variations in the dispatch per day, and also during the day are great. But the number of packing machines and the number of workers must be adapted to the maximum loading, and the utilization of the machines and the people will periodically be low. Until a few years ago most of our produots were delivered by railway or by boat and the factories had then good possibilities to survey the actual needs of machines and people from day to day, but by reason of the great increase in road transport, today about 60 % of the fertilizers is fetched from the factories by trucks, 25 % is still shipped by boat and only about 15 % by railway. The fetching by trucks cannot be directed by the fertilizer supplier so that a fairly regular loading per day can be reached, but the trucks come often to the factories or to places in the neighbourhood with other goods and bring fertilizer back as return cargo. Weather and state of

roads are other incalculable factors, which can effect very great differences in the quantities loaded from day to day. The increased fetching by trucks has also caused a concentration of the dispatch to the period, when the spreading in the fields takes place. This is quite naturally because the bags can be sent from the factory directly to the farmer, and the costs for handling are only those for the transport. To dispatch the whole annual output during 2 or 3 months is almost impossible and would cause very large needs of stores at the factories, high internal costs of transportation and a large-scale bagging plant. With application to periodical price additions and storage compensations we have attained a good levelling of the dispatch from the factories during the whole year, with exception of May and June, (Fig. 1.)

There still remain considerably larger deliveries during January, March, April and October and then the time of waiting for loading can rise to 2 to 3 hours and exceptionally up to 6 hours. To decrease the time of waiting for load, to get a more regular employment and a better utilization of the sackfilling equipments, we decided to build stores for bagged fertilizers at our factories. When the capacity of the bagging plant is insufficient, loading from the bagged material store takes place and when the direct loading from the bagging machines do decreases, the store can be filled up again.

Filling of Sacks.

Our fertilizers are packed in paper sacks made of 4 ply kraft paper 75 g/m^2 (31 D.C.) with one ply union paper 125 g/m^2 (54 D.C.) in the centre, but sacks for potassium-superphosphate consist of 3 ply kraft paper 75 g/m^2 (31 D.C.) and 2 ply union paper 100 g/m^2 in the centre (41 D.C.). Since we began to use paper bags in the late 1930's, they have been of the sewn open mouth type with top closure made by sewing or cord tying. We have, however, after tests during more than 4 years now decided to change to pasted valve type sacks. The filling of them is effected with machines of S: t Regis´ type, which with two scales has an average capacity of 600 bags of 50 kg (110 lbs) per hour. With valve bags the packing costs will get lower, because after filling no closure is necessary, and the filling can be done by only one man per machine. Most of the Swedish manufacturers have or are planning to buy machines to make pasted valve bags with stepped bottoms. Such a pasting makes them just as good as the sewn bottoms.

After the filling the sacks are delivered directly for distribution to the customers or proceed on conveyor belts to a storehouse.

Bagged Material Store

The store's size has been determined by the factory's capacity and the seasonal variations in the deliveries. We took also into consideration a proper utilization of the existing packing equipments. There are four of them, each with a capacity of 240 tons per 8 h.

Our two biggest factories have an annual output of about 270,000 tons and we have calculated that a building taking 8,000 - 10,000 tons is big enough to take up the periodical differences of the dispatch. Such a storehouse must have a floor area of about 2,000 m^2 at a free height in the whole storehouse of at least 6,8 m. In the area are truckways etc., included. The store's capacity can be turned over 8 to 10 times a year.

Handling in the Bagged Material Store.

The store should allow a big loading capacity with a small staff of workmen, and the receiving of filled sacks has to be done with little manual labour too, because the arriving quantity in most cases depends on the possibilities for direct loading from the packing machines. Therefore the supply from every bagging machine can range from 0 to 600 bags/h in a day.

These demands could be satisfied by bags on pallets and stacking them with a fork truck, which also should be utilized for the loading. With bags on pallets the store's floor-surface can be utilized effectively to about 70% capacity, without covering the ways for the fork trucks. The pallet itself takes 12 - 13 % of the space for one pall load. To reach as high capacity as possible, warehouses for palletized goods ought to be built without pillars internally and the walls have to be quite even on the inner side.
The filled sacks proceed to the store on conveyor belts from the bagging machines. They will be directly palletized in a fully automatic pall loader, manufactured by a Swedish firm. It can palletize 900 sacks/h and builds thus one unit pall load with 30 sacks in two minutes. Pallets can be put into the machine's palletstore and the pallet loads can be removed from a roller way with a fork truck, without stopping the loader. (Fig.2).

The choice of the most suitable size of pallets has been considered very closely. The Economic Commission for Europe (ECE) has in December 1958 resolved to recommend using 800 x 1200 mm pallets (32 x 48 inches), which is the same as that, which the international railway union (UIC) wanted to introduce. This type of pallet, is not so suitable for 50 kg-bags (110 lbs) and does not allow stacking

to more than 3,7 m, with unit loads of 21 sacks i.e. 1050 kg (2300 lbs.). When stacking more than three pallets on each other the pile will tend to lean sideways, which makes the removal of the pallets more complicated, and there will also be a big risk of the stack to coming down. That made us, abandon the size mentioned above, and choose a pallet with the dimensions 1050 x 1300 mm (41 x 51 inches). It is fitted in Sweden to the maximum admitted breadth of trucks, which generally is 2300 mm (90 inches). These pallets make it possible to load lorries and railway cars of normal performance to full carrying capacity. (Fig. 3).

The pallets are made for only two-ways handling in order to get good stability and durability. They are decked on both sides, to prevent the sacks being damaged in the pile, and are made of birch - or pinewood. The weight is 30 - 40 kg (65 - 85 lbs) and the price is about 14 Swedish Crowns (£ 1. -).

On every pallet we put 30 bags (i.e. 1500 kg or 3300 lbs) with 5 bags in a layer, which are stacked in a special way to keep the layers within the pall load together. The sacks are not fixed to the pallet and we have not found it necessary for our products to stabilize the sacks with adhesives or something similar. The empty sacks have the dimensions 55 x 64 x 14 cm, and filled they measure 43 x 62 x 16 cm and correspond almost perfectly to the pallet size, so we get none or a very small overhang, which is of great advantage for the automatical pall loading. The pallet takes a floor area of 1,5m^2 and has a total height of 1,1 m. Stacking can be arranged up to 7,5 m, that is seven pallet loads on each other.

All handling in the bagged material store is carried out by fork trucks with a capacity of 3500 kg (7700 lbs). By stacking, the truck has a capacity of 25 - 30 pallet loads per hour, when the average transport distance is 25 m. By loading, the truck takes two unit loads at the same time and one man with a fork truck can therefore load 40 - 45 pallets per hour. Without the new stores our factories in Landskrona and Norrköping could only load bagged goods direct from the machines with an average capacity of 85 tons/h. To satisfy the bigger demand of loading during the seasons the bagging and loading have been running in two shifts, but we also have had to resort to bagging with simpler machines, which require much more manual work. In this way we have been able to load about 1600 tons per day.

Now all bagging will be done with the semi-automatic packing machines only, even though they periodically must run 16 hours per day, but the dispatch can be arranged only in day shift, owing to the loading from

the bagged material store. One fork truck, only occupied in loading, has a capacity of 60 t/h, and with two fork trucks we have increased our seasonal dispatch capacity from 85 t/h to 205 t/h, without enlarging the bagging plant. These two trucks can, if necessary, run in two shifts and then it is possible to increase the total loading per day to 2500 tons, that is 50 % more than we could reach in 16 hours without the new store.

The arrangement for the supply of filled bags to a store with an automatic pall loader also reduces waste and waiting times at the bagging machines, which considerably increases their effectiveness.

Distribution.

In order to reduce the storage of fertilizers at the factories and to facilitate distribution in season, we have a few stores of our own. These stores are now to be supplied with the fertilizers in palletized bags. This has become possible owing to the better utilization of our factories' bagging plants and the very good quality of pasted valve bags for storing fertilizers of different kinds.

Most of these transports are made by trucks, the platform of which will be replaced by a roller system. For these trucks we intend to make a special loading equipment, consisting of an inclined roller way connected to the pall loader and with space for 10 pallets in two rows. (Fig. 2.). When the truck is ready for loading, the rollers of the loading equipment are made free, and the pallets roll away onto the lorry, the rollers of which will be braked during transit. For unloading there will be a similar arrangement. In this way loading and unloading can take place in two minutes, compared to 15 minutes, when using a fork truck.

To our quayside stores, as well as those of our customers, the fertilizer is mostly sent by boats of 100 - 200 tons. For this type of transport we have ordered a motor ship with a deadweight of 1000 tons. It will be specially built and arranged for carrying palletized goods. With two deck-cranes and a loading fork, which can take 2 pallet loads, the ship can be loaded or unloaded in 8 hours.

Summary.

Of course palletizing and storing filled bags will cause an additional cost in our factories, compared to direct loading. But we consider, that such arrangement involves very great advantages in the dispatch and creates possibilities of a rational utilization of machines and people in the bagging plant, and also of the factories' stores.

The biggest profits, however, will arise in the further handling, when the bags have left the manufacturer. This form of delivery would be perfect if the pallet load once built in the factory could pass unbroken through the whole distribution chain right away to the farmer, it is probable that this will be so to a large extent in a couple of years.

Already loading at the factory, transport by truck to the retailer's store and handling there of unit pallet loads can save up to 7 Swedish crowns per ton (L.-,10.-) compared to the usual "sack by sack" handling.

Sale of Superphosphate containing fertilizers 1958-59.

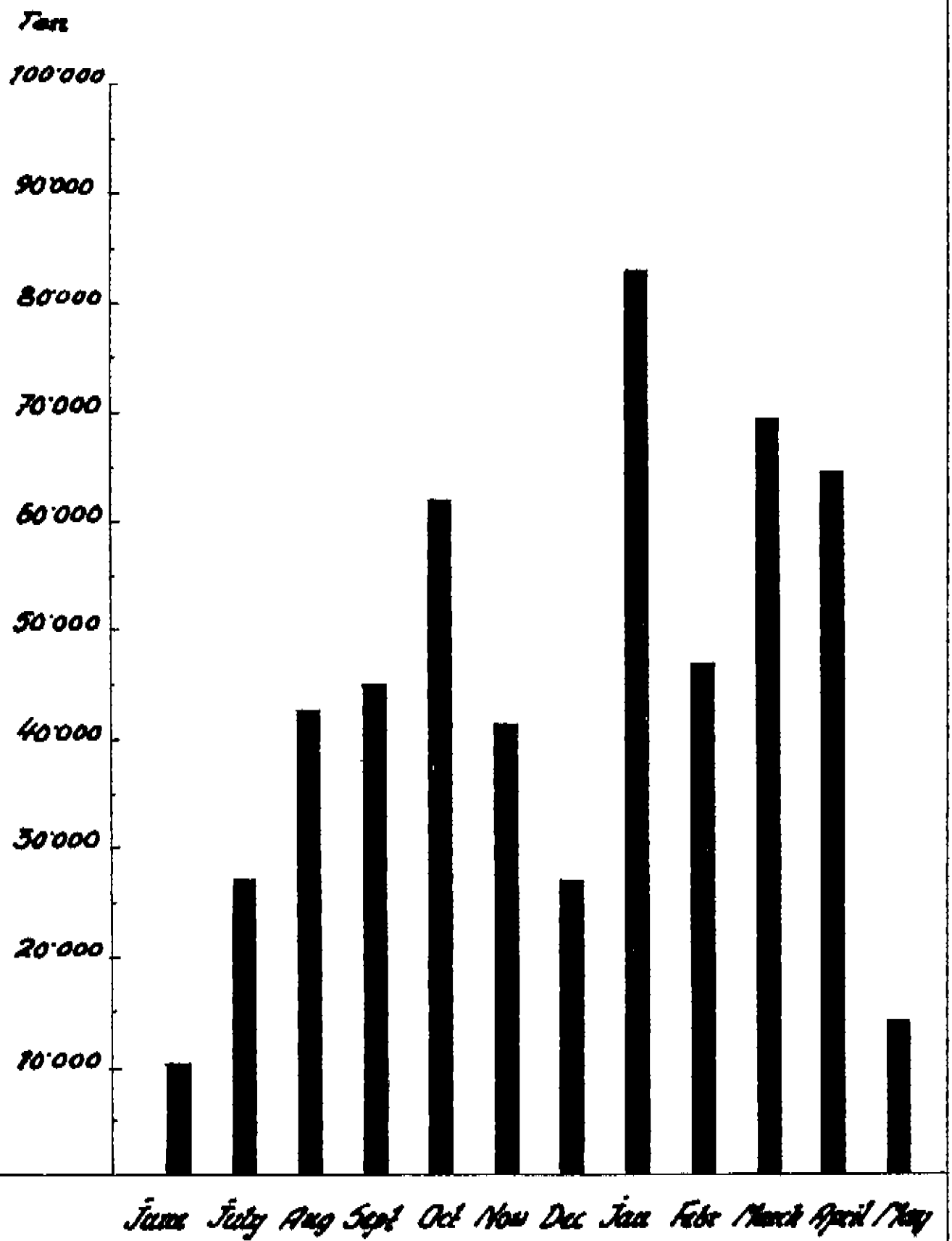

Fig. 1

Equipments for palletizing and pallet handling

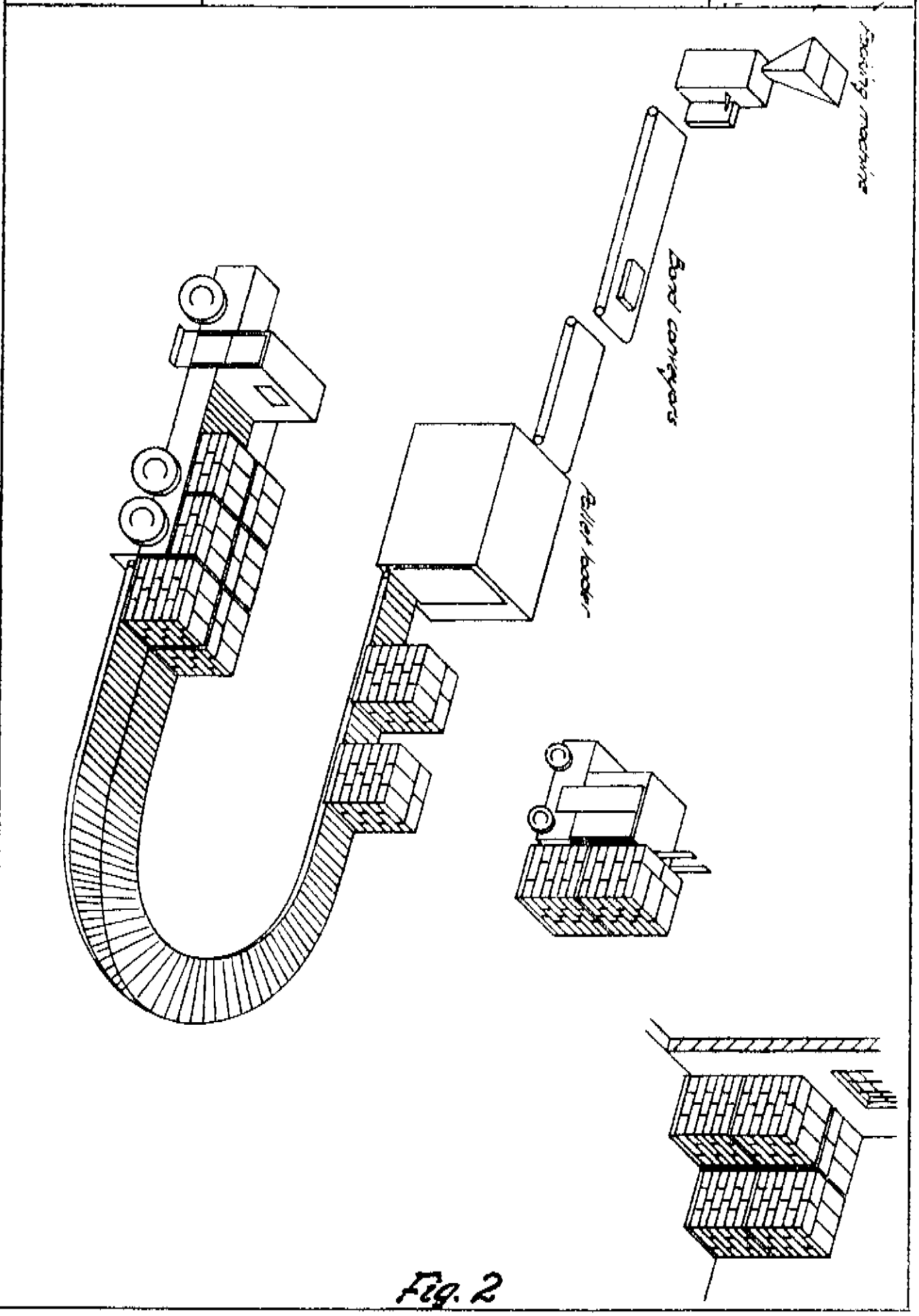

Fig. 2

Pallet load

1500 kg (3300 lbs)

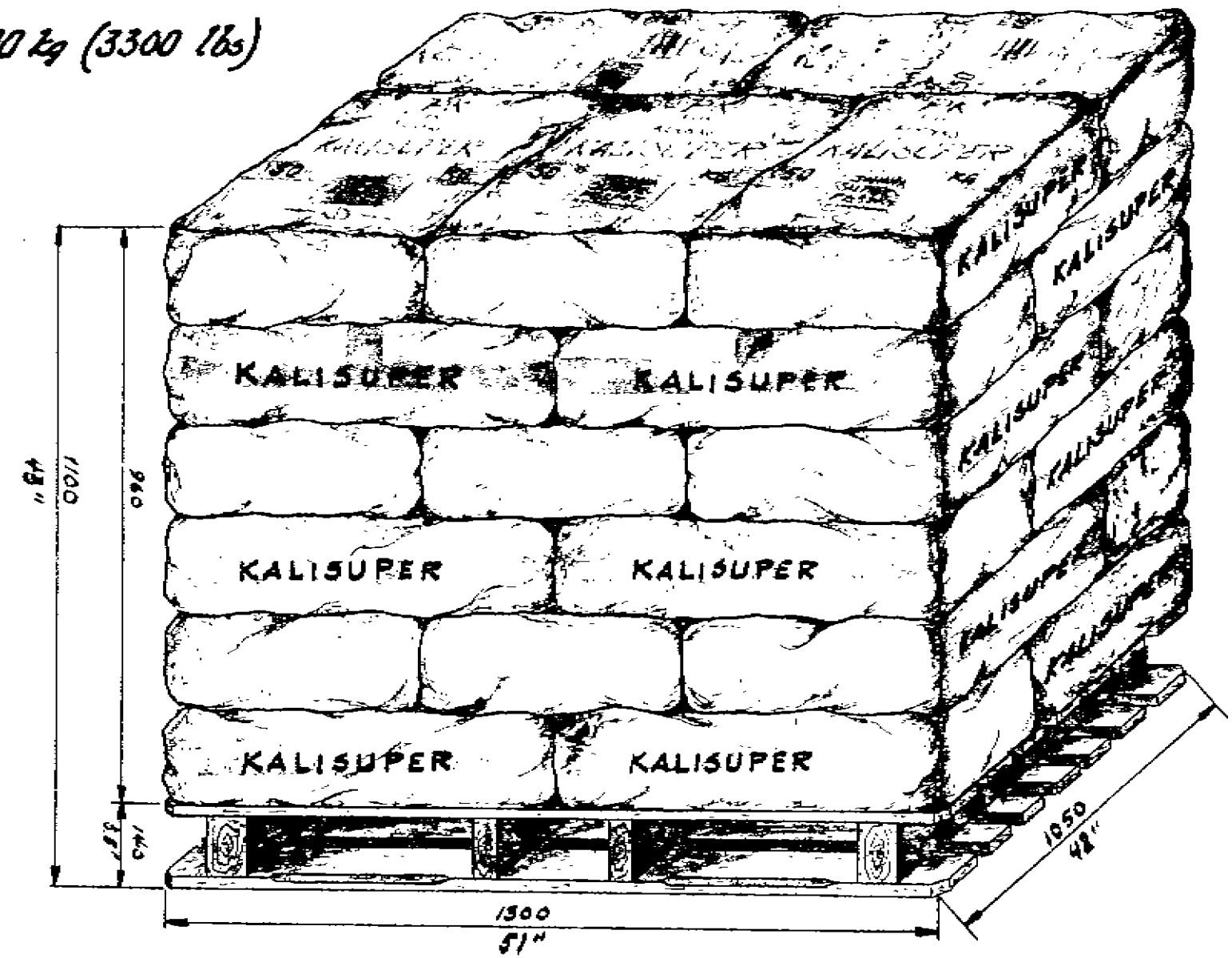

Fig. 3