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# New method for Handling Citrus Fruits

## from orchard to packing house uses simple equipment

One-man operation of equipment for loading and unloading bins, and for moving the equipment up and down the box roads, is the essential element in a new method of handling citrus fruits between the orchard and the packing house.

The new one-man handling method also uses new light weight bins made of fiber molded into round nesting drums. The bins are 32″ high, 24″ in diameter at the top, and hold the equivalent of four California standard citrus field boxes, or a little over 200 pounds. Like the field boxes in current use, the bins are filled by the pickers from their picking bags.

The handling equipment is a tractor with a boom hoist mounted on it, pulling a trailer. The operator stands on a platform at the rear of the tractor. From this position he drives the tractor, manipulates the boom to lift up the bins from alongside and set them on the trailer. The trailer is equipped with a roller bed so the operator can push stacks of bins to the back end of the trailer.

The bins are placed alongside the box or drive roads much as are present day field boxes. Initially the operator, working alone, distributes his bins for the pickers, setting off at each picker's block of trees the required number of bins.

Tractor with boom hoist, trailer and bins.

In doing so he need not leave the tractor platform, except to go back on the trailer to pull up more bins.

In loading, the operator stops alongside a bin, drops a grapple onto it, actuates the hoist mechanism with a pull cord, and guides the bin into place. The bin is placed on the rollers of the trailer bed and a spider frame to hold a second bin is put on the top of the first bin. The stack of two bins is then pushed over the rollers back into place. Detents, built into the roller frames and into the superstructure, hold each stack of bins securely in place.

The most important economy achieved with the system is the limitation of the handling operation to one man. Commonly, today, three or four men are involved in loading field boxes onto trucks and the prospective savings in labor are almost in the proportion of the men not needed.

Preliminary tests have established that one man can load five tons of fruit in from 25 to 40 minutes, depending on the yield and resulting closeness of bins to each other. The work is easy enough so the man can maintain this rate of work all day. One man, if he did nothing else, could load up from 50 to 80 tons of fruit in one day and have it at orchard edge ready for hauling down the road.

The whole arrangement is an illustration of motion and time analysis. The operator is given a specific center from which he can do all the tasks that are

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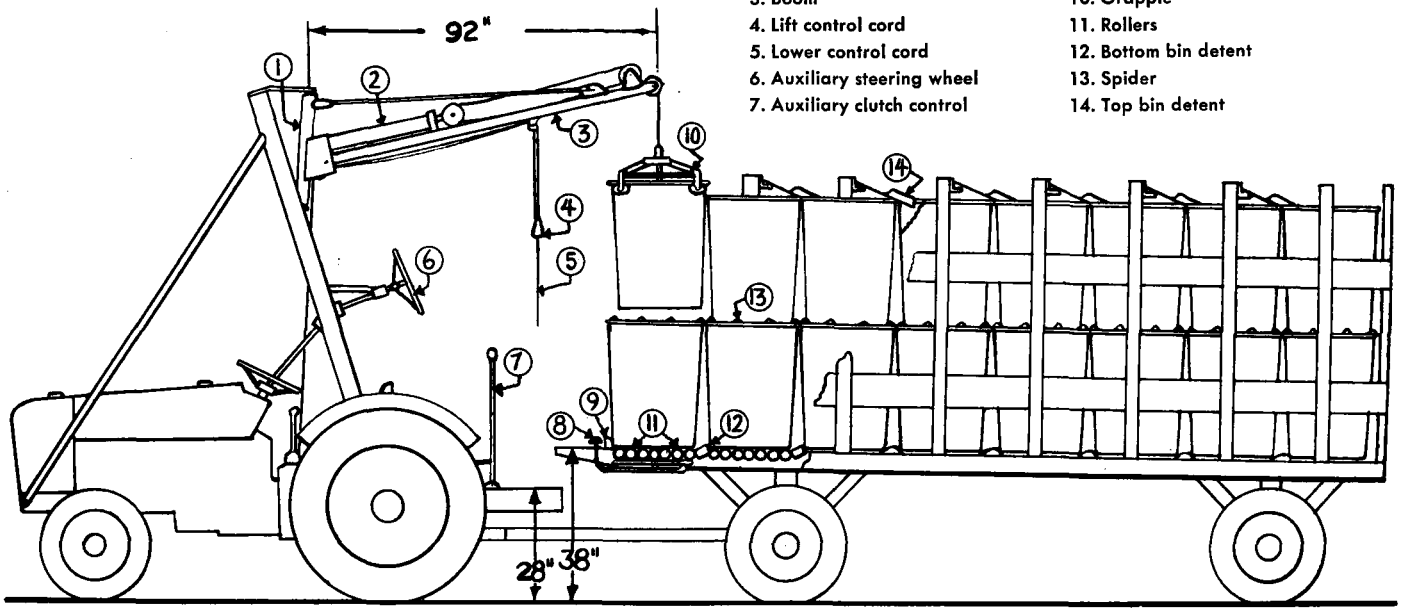
**Diagram of tractor, boom hoist and trailer.**

1. Mast
2. Hydraulic cylinder
3. Boom
4. Lift control cord
5. Lower control cord
6. Auxiliary steering wheel
7. Auxiliary clutch control
8. Front roll release pedal
9. Bin guide
10. Grapple
11. Rollers
12. Bottom bin detent
13. Spider
14. Top bin detent



## HANDLING CITRUS

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needed. By proper arrangement of equipment and method, they are done in the easiest and quickest way possible. Each one of the tasks comes in a time sequence so an extra man can not be effectively used.

The trailers permit the use of the booms on light wheel tractors which, compared to trucks, are designed to move slowly through the orchard with their weight distributed over larger size tires. The tractors have better traction, and cause less dust and less soil compaction. On the road, two trailers in tandem can be hauled by a fast truck. Only one or two such trucks, each with a driver but no swamper, meet the needs by a packing house because the drivers merely unhook and hook up their trailers at orchard side and at the packing house. As designed, two trailers can be hauled each trip, carrying the equivalent of 384 standard citrus field boxes or 10–11 tons of fruit.

Assuming four minutes are required at orchard edge for unhooking trailers with empty bins and hooking onto loaded trailers, eight minutes for unloading at the packing house, and a driving rate of 35 miles an hour on a 10 mile round trip, one man can make 14 trips in eight hours with a total load haul of 140 tons of fruit. He can, at the same time, return to the orchard an even greater volume of empty bins.

The dimensions of the bin reflect several considerations. The first consideration was the effect of bin size on pickers' performance. In light-crop picking a big container would require some long carries by the picker. A partial fill of a big container would be less efficient in handling and might result in inaccurate measurement. Since pickers are paid by incentive rates, such factors are important.

A second consideration was the maximum height at which a picker could conveniently empty his bag. A third consideration was the structural strength of the bottom of the bin; too great a cross diameter would weaken the bottom relative to the cost limit.

The round bin is primarily a wood fiber product with some glass fibers added. It is molded from a slurry. Strength is achieved at low cost because of the natural strength of the material and its use in a round self-supporting shape. It is anticipated that the bins will have a long life and seldom need repair. The material and method used in their construction, their round shape and the method used in handling them indicates a life materially longer than that of field boxes.

A common objection to round bins has been the impression that they waste space. As a first approach it should be noticed that while a circle loses 21.46% of a square, a pallet bottom uses up 20% of the depth of a 30″ high bin, 24″ in depth.

Moreover the thickness of the side of a round bin with reinforcing rim need not exceed a half inch and may be less. A square bin, on the other hand, must have reinforcing for its sides which to date has ranged from one to four inches. A 1½″ wall on a 36″ square pallet bin wastes 16% of the volume occupied while a ½″ wall on a 24″ round bin uses only 8.2% of the volume occupied. The tapered form needed for nesting wastes an additional 11.4% of the square. In total the round bin wastes 41% of volume while the palletized container in the dimensions given wastes 36%.

When nested in storage, the round bin requires only one-quarter the space of the pallet, and when loaded six high in hauling, it requires only one-third the space.

It is important to note that the use of a roller floor on the trailer in conjunction with a roller floor on the receiving dock permits very quick unloading at the packing house. Complete mechanization of the handling and dumping has not yet been attempted with the round bin.

The essential new element in the proposed method is economy in the use of manpower. The tractor boom, the roller floor, the trailer superstructure are all simple mechanical concepts. Even the bins, while made up of new materials, are old in concept as to shape as can be seen in the barrel and particularly in the bushel basket.

What is particularly important is that these mechanical features are put together into an arrangement so that one man can drive a tractor and from the same position carry out the tasks of distributing bins, picking them up, and stowing them on the trailer, easily and with speed.

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## CANNERIES

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approval of the Director of Agriculture, for California state programs—or the Secretary of Agriculture, for Federal programs. Under California enabling legislation, a marketing order for a particular farm product may include one or more of the following provisions: volume control; quality, size, grade, pack or container regulation; advertising and sales promotion; research; and prohibition of unfair trade practices. Once made effective, the provisions are applicable to all in the specified industry.

Cooperative bargaining associations are established under and operate subject to federal and state legislation on cooperatives. Cooperative bargaining associations are generally in fruits and vegetables for processing; the association's management—on behalf of the membership—bargains with cannery customers with respect to price and other terms of trade. This can be done whether or not a marketing order is in effect.

Any of the three—growers' cooperative canning, marketing orders, and cooperative bargaining association—may exist independently of the other two. Some crops have only one of the three, some have two, and some have three—other crops have none of them.

### Competitive Structure

The growth in grower cooperative canning of fruits and vegetables is part of the changing market structure of the canning industry. Over the years, the larger firms have been accounting for an increased proportion of the output and sales. Cannery customers have also tended toward volume concentration as private chains, cooperative retailer buying groups and wholesaler-retailer teams —direct buyers from canneries—have been replacing the former many independent wholesalers.

Grower cooperative canning is, in part, a reflection of growers attempting to maintain and increase their returns as the competitive nature of their market changes. At the same time, the several cooperative canning groups in the state compete among themselves, as well as with private canning firms, for markets. Competition for cannery customers is being restructured rather than eliminated. The changing form of competition is related to the distribution of benefits and burdens among farmers, canners, distributors, and consumers.

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*An article on grower cooperative bargaining associations will be published in a forthcoming issue of* California Agriculture.