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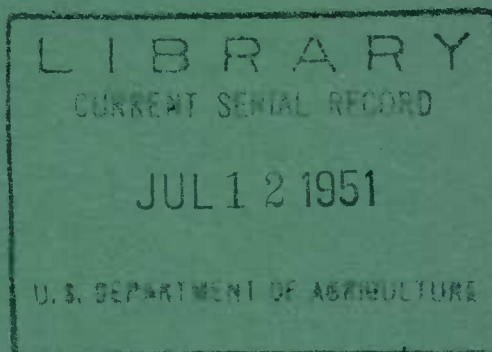
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Use of
Recording and Transcribing Equipment
In Loading Delivery Trucks
of
Produce
Wholesalers



UNITED STATES DEPARTMENT OF AGRICULTURE
PRODUCTION AND MARKETING ADMINISTRATION
Marketing and Facilities Research Branch

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USE OF RECORDING AND TRANSCRIBING EQUIPMENT IN LOADING DELIVERY TRUCKS OF PRODUCE WHOLESALERS

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SUMMARY

A method of using voice recording and transcribing equipment in the loading of delivery trucks was developed and tested in the warehouse of a service wholesaler where two 3-man crews previously were used in truck loading operations. The use of this equipment resulted in the elimination of the checker in each crew. Thus, where the checker is one-third of the loading crew, savings amounting to one-third in the labor cost of loading can be effected. Time studies at the test warehouse showed a saving of 80 man-hours per week through the elimination of 2 checkers--1 on each crew. On the basis of an assumed wage rate of \$1.25 per hour, this saving amounted to \$100 per week, which in a period of 4 months will more than pay for the cost of the equipment.

Time studies of operations performed at the warehouses of service wholesalers indicate that the loading of delivery trucks is one of the most costly, on a tonnage or volume basis, of all operations performed. Ordinarily, it is necessary, first, to assemble the merchandise for one truckload from a recapitulation of the individual orders or invoices. A large percentage of the service wholesalers follow the practice of having one man (checker) call the items, one at a time, from the invoices during the actual loading of the truck, while other workers pick up the merchandise, package by package, and stow it on the delivery truck. The new method of loading made use of recording and transcribing equipment in this phase of the operation to replace the checker.

By making a recording of the individual items shown on each invoice and playing back the recording during loading instead of having a checker call the items, the reduction in the size of crew was accomplished with no decrease in the rate of production. In fact, time-study data showed that the production rate increased after the workers became experienced in using the equipment. The smoother movement of merchandise from assembly areas onto motortrucks also resulted in savings in man-hours in related phases of warehousing operations and reduced the total elapsed time required to perform the assembly and loading operations, thereby reducing the time the produce was exposed to heat or extreme cold weather conditions.

Although the cost of the custom-built installation at the warehouse where the tests were conducted amounted to slightly over \$1,300, this cost does not appear excessive for this warehouse, since the outlay will be recovered in about 4 months. Generally, service wholesalers who employ only one full-time checker should be able to install such a system at a cost of about \$850 and recover its cost in about 6 months.

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Special credit is due Catharine A. Perry and Clayton F. Brasington, Jr., of the Branch for preparing the sketches included, and Frederick J. Miller, former industrial engineer with the Branch, who participated in the field work in connection with the study.

* * *

The study on which this report is based is part of a larger research project covering the handling of various types of packages of farm and food products in stores and warehouses. This is the second of a number of reports to be issued prior to the completion of the project. The project is being financed with funds appropriated under the Research and Marketing Act of 1946.

* * *

INTRODUCTION

One of the major factors contributing to the costs of fresh fruit and vegetable distributors who make deliveries to retail outlets is the operations associated with loading the orders onto delivery trucks. Service wholesalers generally are interested in finding equipment and methods that will increase the efficiency of their operations and thus assist them in maintaining their competitive position. ^{1/} However, in many instances throughout the industry, a lack of research and exchange of ideas has contributed to the use of relatively crude and expensive methods in connection with all materials-handling operations, including loading.

If the job of loading service wholesalers' delivery trucks is to be done most efficiently, it involves solving a number of problems. One of these problems is that to use certain types of handling equipment most efficiently, it must be possible to take the equipment directly from the floor of the warehouse onto the motortruck. In a number of facilities this cannot be done because of the difference in the respective heights of the truckbed and the floor of the warehouse.

Another problem is that the motortrucks must be loaded with regard to the order in which the deliveries are to be made to the retailers on the route. That is, items must be loaded in reverse order to the order in which deliveries are made, and placed in the motortruck so that the driver can unload the ordered items with a minimum of rehandling as he moves from stop to stop along his route. Also, the motortruck must be so loaded that the easily damaged merchandise is not bruised or crushed before reaching the delivery point. This means that such items as potatoes, lettuce, and boxed apples must be placed on the bottom near the floor of the motortruck and that items such as tomatoes in cartons and strawberries are placed on top of the load. All this must be done with expediency and accuracy, since it is essential for good business relations between wholesaler and retailer that orders be delivered in good condition and that they be accurately and completely filled.

Studies to evaluate different methods and types of materials-handling equipment for use in performing loading operations are now in progress. During the course of these studies, a method of loading delivery trucks which incorporated the use of one type of recording and transcribing equipment was developed, installed in one warehouse, and tested under actual operating conditions. ^{2/} This report describes and compares the original method of loading with the method which incorporates the use of recording and transcribing equipment. Although the report covers the loading operations of a fresh fruit and vegetable service wholesaler, the method described should find wide applicability to the operations of other types of service wholesalers.

^{1/} The term "service wholesalers", as used in this report refers to dealers who obtain orders through field salesmen or over the telephone and make deliveries to their customers.

^{2/} Only one type of recording and transcribing equipment was used in this study, because the object was to test the feasibility and efficiency of the method rather than of the equipment.

In order to evaluate the two methods, time studies were made of the loading operations before and after incorporating the recording and transcribing equipment into the operation. Data developed from these time studies serve as a basis for making comparisons between the two methods.

THE ORIGINAL METHOD OF PERFORMING LOADING OPERATIONS

The method of performing the loading operation described here is that formerly used in the warehouse where the experiment was conducted prior to the introduction of the recording and transcribing equipment. Although loading procedures and handling methods differ widely among service wholesalers, the equipment and method described in this report should prove to be adaptable to a wide range of facilities.

Office Procedure

Each driver-salesman made up, by items or commodities, a recapitulation or summary ("recap" is the common name applied by the trade) of all orders or invoices for the customers on his route. This recap was telephoned to the office at the end of the day. Office personnel made a copy of the recap in duplicate as it was called in to them, item by item, over the telephone. In the office, tonnage was computed for each load or route and a master recap of all loads or sales was made for the use of management and the purchasing department. Out-of-city salesmen forwarded their invoices to the office (by bus or other available transportation), where they were checked against the recaps which had been made up from the earlier telephone call. 3/ Price extension and totals on the invoices were checked. A list of the items which were to be "split" for small orders was also made up from the invoices. 4/ A copy of the recap for each truckload or route was then sent to the shipping floor, where it was torn along perforations which divided the recapped items by departments. The separate pieces were then assigned to the assemblers working in the different departments and served as their working copy for assembling merchandise. Dividing the recap in this manner permits a number of workers to assemble merchandise simultaneously without interference with other workers; it also eliminates the possibility of duplicating items. Lists of the split items for each load were also sent to the man who made up the split packages.

Assembly

In the assembly operation, all merchandise for each load or route was picked from stock and was brought to the proper loading area.

Equipment Used

Dead skids, moved by both manual and electric-motorized low-lift hand trucks, were used to bring the merchandise from the storage points to the designated loading area.

3/ Local driver-salesmen upon returning to the warehouse make up the recaps and turn them over, together with the invoices, to the clerical staff.

4/ A number of service wholesalers of fruits and vegetables sell certain items to small dealers in quantities less than the original package. This is known as "splitting" or "split-package sale."

Equipment Used



Figure 3.--Assemblyman taking an item from stock and placing it on the skid.

Cantilever-type belt conveyors, which were extended directly into the motortruck bodies, and lateral belt conveyors, which were used to feed the cantilever conveyors (fig. 6), were used for loading.

By reversing the direction of the belt, each set of lateral conveyors could feed alternately two cantilever belt conveyors which carried the products directly into the motortruck. Since two sets of this combination of conveyors were in use in the warehouse, there were four assembly and loading points or areas from which two trucks could be loaded simultaneously.



Figure 4.--Assemblyman depositing a skid load of items which have been picked from stock in conformity with the recap at the assembly point alongside the belt conveyor.

Method Used

Each assemblyman received a part of the recap covering a number of items or commodities which he was expected to fill for a specific truckload. From the storage point in the warehouse or refrigerator car (fig. 1), the worker picked up the items needed at that point and checked his recap for the next item as he moved away (fig. 2). At the next stop he picked up and placed the next commodity needed for the truckload on the skid (fig. 3). This routine was continued until the skid was loaded. The loaded skid was then moved to and dropped in a designated assembly area alongside the belt conveyor (fig. 4). With his transporting equipment the assemblyman then picked up an empty skid and repeated the above procedure until his part of the truckload or recap had been filled.



Figure 2.--Assemblyman en route between storage points referring to his recap for the next item needed



Figure 1.--An assemblyman picking up one of the items listed on the recap at a refrigerator car.

When the assembly of the entire truckload had been completed the operation was repeated for the next truckload at another assembly area. A check of each assembled truckload was made to assure completeness and accuracy.

Motortruck Loading

In the motortruck loading operation, the assembled produce was placed on the belt conveyor by one of the workers as it was called, item by item, by the checker. The conveyor moved these items to the worker inside the motortruck, where they were removed and stowed (fig. 5).

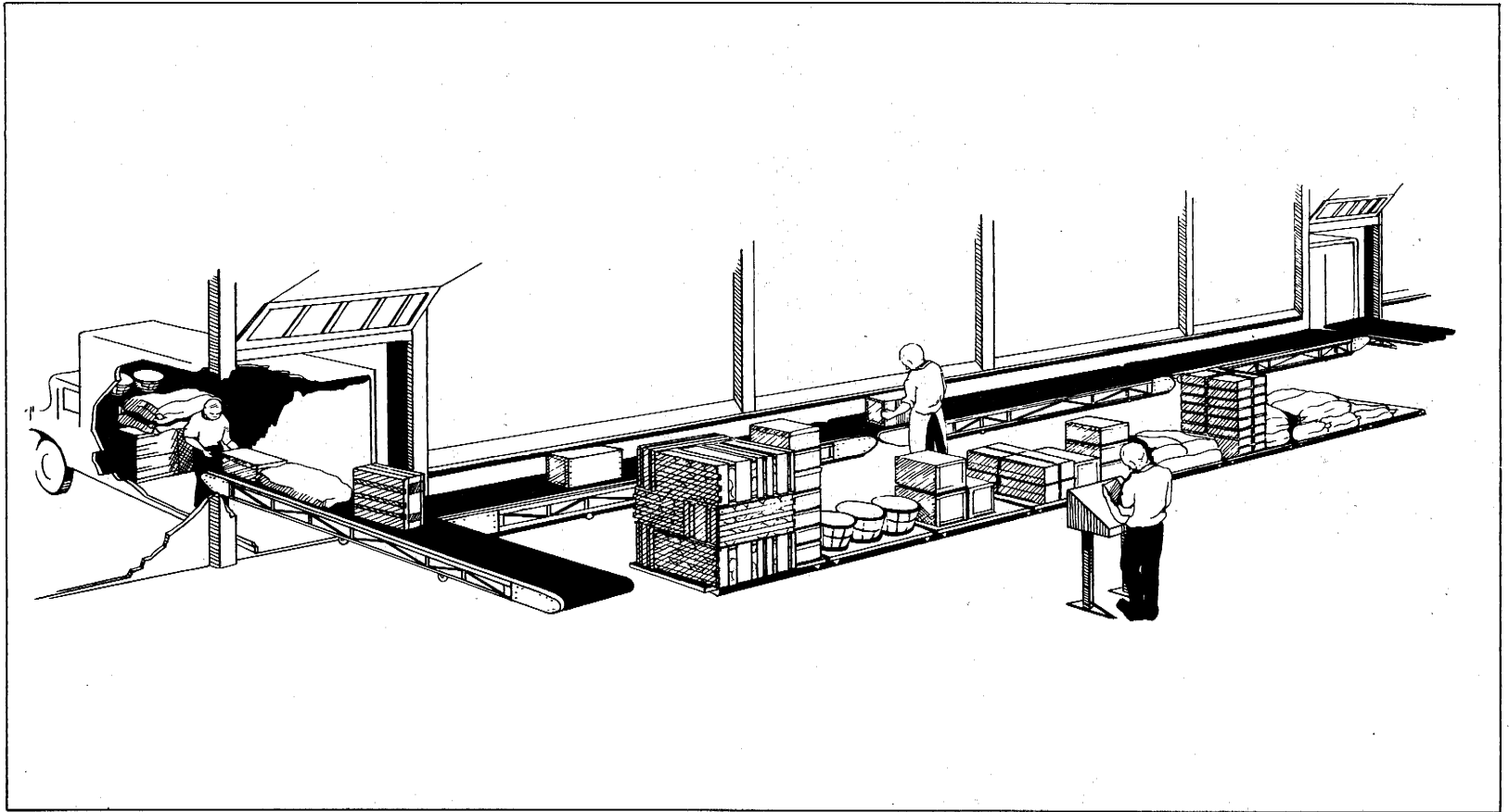


Figure 5.--Original method of loading the assembled items onto the motortruck. (Note that a checker is needed to call the items.)



Figure 6.--Cantilever belt conveyor, extended into the body of the motortruck, being fed from one of the reversible lateral belt conveyors. Note 100-pound bag of potatoes being automatically transferred from lateral conveyor to cantilever conveyor.

Method Used

Three men were used for loading each motortruck: One worker inside the motortruck who removed the packages from the conveyor belt and stowed them, one checker who called the items in proper sequence from the invoices, and one man who placed the items as called on the conveyor system (fig. 7). From the invoices which had been arranged in the reverse order of delivery (first delivery to be made from the motortruck was the last invoice to be called), the checker began calling one, two, or three items at a time, the number depending on the quantity of each item. As they were called, one worker picked up the items from the assembly area and placed them on the lateral belt conveyor. The worker inside the motortruck removed the packages from the end of the cantilever conveyor and properly stowed them. Occasionally, the checker helped to place merchandise on the conveyor when the items called were near or convenient to the checking stand. Occasional periods of waiting for the checker to call the items resulted in delays or idle time on the part of the other two workers. These delays were caused by the necessity of the checker's interpreting



Figure 7.--Checker calling items. Note laborer working with him and lateral belt conveyor on the right. Man in background is assembling the next load and is not a member of truck loading crew.

quantities as written by the driver-salesman on the invoices and by the fact that he occasionally placed packages on the conveyor and then had to return to the checking stand to locate his place on the invoice before he could call the next item. Some interference occurred between the checker and the man who placed items on the conveyor (fig. 7).

REVISED METHOD OF LOADING MOTORTRUCKS USING RECORDING AND TRANSCRIBING EQUIPMENT

In an effort to increase the efficiency of loading operations in the warehouses of service wholesalers, the method previously described was revised to incorporate the use of recording and transcribing equipment. This method, with the necessary equipment, was installed in one warehouse and tested under actual operating conditions. A description of the revised method follows.

Office Procedure

As was done in the original method, the driver-salesman made up a recap and called it in to the office at the end of the day. Other office routine was essentially the same, except that as a separate recap of the split items was made, a clerk called off all the items from the invoices for the truckload and recorded them, through the use of a recording machine, on a thin, flexible plastic belt, 3½ inches wide and 12 inches in circumference, called a memobelt.

Recording Equipment Used

In addition to the usual equipment, the recording machine was placed in the office. The machine was started and stopped by a hand or foot switch. A desk type microphone was used in recording the necessary information on the memobelt (fig. 8). These belts, on which the orders or invoices for two heavy or three light truckloads can be recorded, can be filed in a 4- by 6-inch box.

Method Used

The office procedure was much the same as that previously used. However, a recording machine was added. As previously mentioned, in the revised operation one of the steps required is to go through the invoices to make up the split item sheet. The office clerk starts the recording machine and first calls the load number, the truck number, and the total tonnage for the load. This serves to identify the load and gives the night or loading crew the other necessary information they need to do a good job. The items and quantities of each to be loaded are then called, and a split item sheet made up at the same time. This recording operation requires very little additional time over that required by the original method, since it is done in conjunction with tabulating the split items. In making the recording, the clerk calls for each order the quantity of each item to be placed in the motortruck, for example, "two potatoes, one cabbage, four lettuce," etc. Any special information concerning an item or order is also recorded before that particular item or invoice is called. The items are recorded in order of loading, that is, the last to be delivered is the first recorded. After the recording is completed, the clerk writes the load number, motortruck number, weight, and date on the memobelt and carries it with the recap and invoices to the shipping floor. Time studies indicate that the actual recording of all items for even the heaviest load required no more than 5 minutes.

Assembly

The assembly operation method and the equipment discussed in the original method of loading are used without change.

Motortruck Loading

The major revision in the original method of loading is in loading the motor-truck after the merchandise has been assembled. Here the introduction of transcribing equipment effects the largest part of possible savings in labor required. The crew size is reduced from three to two men without placing any additional work upon the remaining two men (fig. 9). Actually the loading rate is increased somewhat with the smaller crew.



Figure 8.--Recordings of invoices are made by office clerk. Note desk microphone being used and completed memobelt in foreground.

Equipment Used

The equipment employed in the loading operation is as follows: motor-driven belt conveyors (as used in the original method); two transcribing machines, each

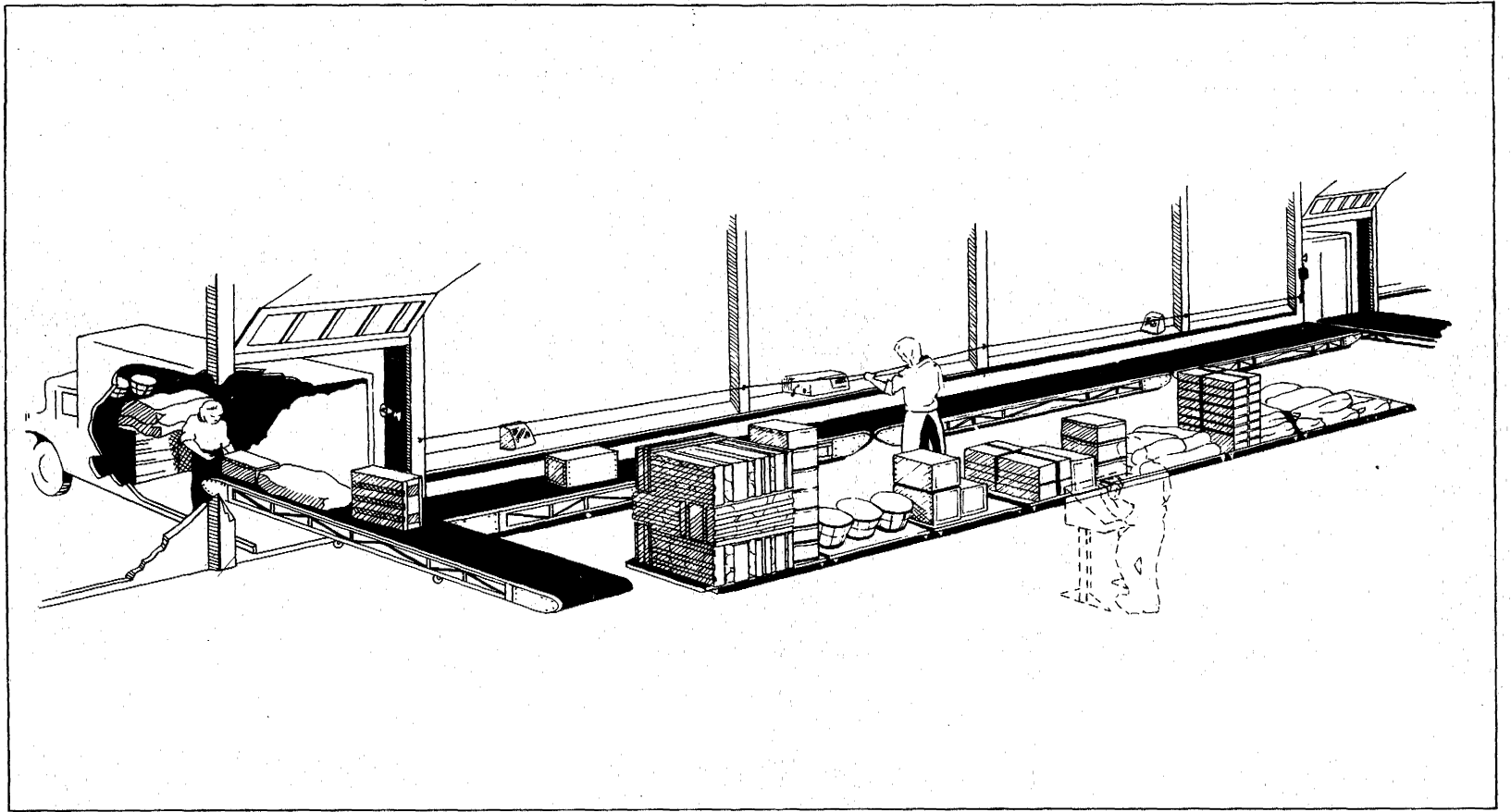


Figure 9.--Revised method of loading the assembled items onto the motortruck. (Note checker no longer needed to call the items.)

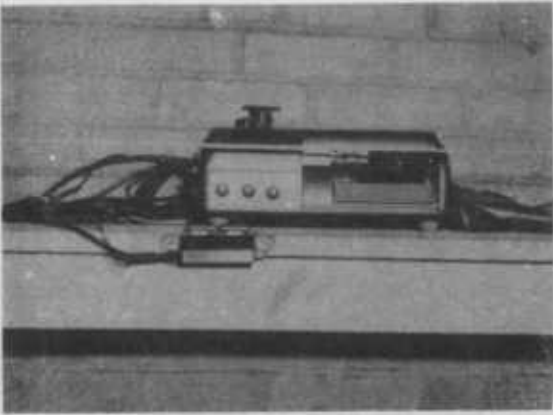


Figure 10.--Transcribing machine used to play back the memobelt recordings and a two-button finger-touch switch, attached to the shelf holding the transcribing machine, which is used to repeat items that may have been missed or not understood clearly.

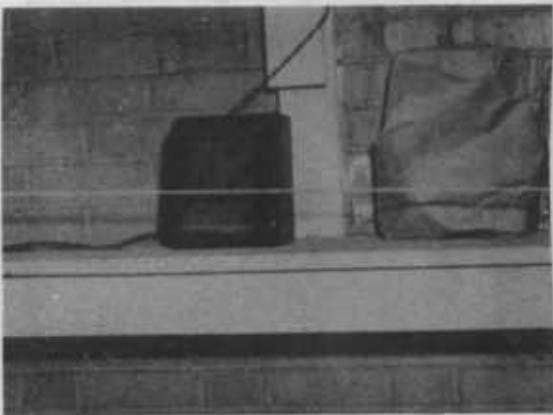


Figure 11.--One of the eight speakers installed throughout the loading areas. This type of speaker was used temporarily and will be replaced with other speakers with matched impedances.

serving two loading points (fig. 10); eight speakers, two used at each loading area (fig. 11); two micro-switches, one connected to each transcribing machine (fig. 12); and two finger-touch repeat switches (fig. 10), one connected to each transcribing machine.

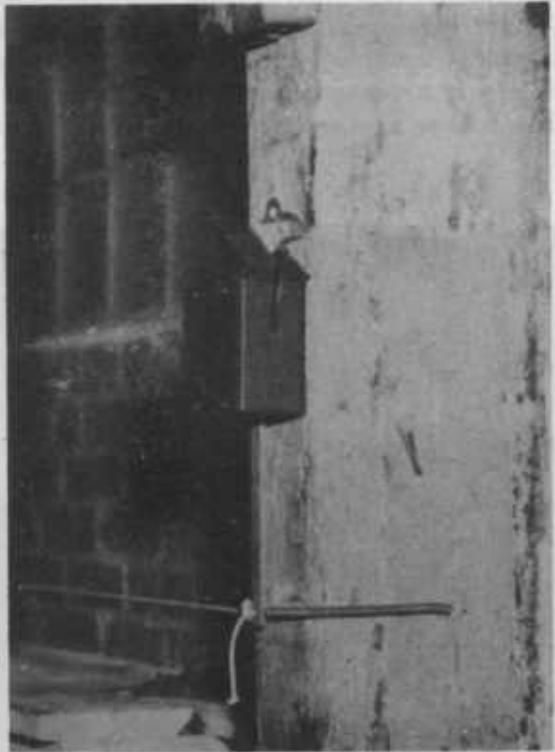


Figure 12.--Illustration of the type of micro-switch assembly used. The rope which is pulled to activate the switch is visible a few inches below the switch housing. Also attached to the switch arm is a screen-door-type coil spring which returns the arm to break the circuit after the rope is released by the worker.

Method Used

The transcribing machines replace the checker. One worker now performs the remaining duties of the checker and also loads items onto the conveyor from the assembly area. In other words, two men are employed in loading each motortruck, compared with three men in the original method. One worker is stationed in the motortruck, and the other worker places the items as they are called over the loud-speaker onto the motor-driven belt conveyor.

This second worker takes the memobelt and slips it into the transcribing machine. The transcribing machine has three small dials which adjust volume, tone, and speed (fig. 10). Volume and tone controls require no explanation. The speed control regulates the rate at which the items are called. The speed is set faster or slower to conform with the skill of the worker. When the crew is ready to load, it is merely necessary to pull the cord that is strung along the conveyor (fig. 13). This action engages the micro-switch located at one end of the cord (fig. 12). The



Figure 13.--Worker pulling cord which moves the arm on the micro-switch, thus completing the circuit to the transcriber and causing the items to be called over the loud-speaker.

circuit is thus completed and the transcribing machine is started. The information recorded on the memobelt by the office clerk is then called clearly and distinctly. When two, three, or four items have been called, the number depending on the quantity of each item and the skill of the worker, the rope is released to stop the machine. When the items that have been called off have been placed on the belt conveyor, the operation is repeated until all items have been loaded on the motor-truck. Since the rope extends the entire length of the lateral conveyor, the transcriber can be switched on and off at any point alongside it (fig. 13). Each time the rope is pulled, the transcribing machine immediately resumes operation with the same volume, tone, and speed it had when it was shut off. The reproduction of the recording starts off very sharply and clearly. No time is required for warming up or winding up before the sound can be heard clearly and distinctly. One loud-speaker is located at each assembly area so that it can be clearly heard at any point along the loading section of the conveyor. Also, a speaker is directed toward the motortruck, enabling the loader in the truck to anticipate in advance what produce he is to receive from the loading station for stowage. This facilitates better arrangement of the load and results in less damage to the produce. In the event an item is missed, the worker merely presses the small repeat switch (fig. 10), which moves the transcribing machine carriage over a groove or two on the recording, and pulls the rope to start the machine so as to repeat the item. Throughout the experiment it was found that very little replaying was necessary. As workers become more familiar with the method and equipment and develop greater skill, repeating items should rarely be necessary.

Because the successful operation of this equipment for loading operations depends on switching the transcribing machine off and on with preciseness and since it is also necessary to provide a method of turning it off and on anywhere along a distance of roughly 90 feet, a schematic drawing of the essentials of the switch, with a short description of its function, is presented in figure 14 to aid others who may be interested in making an installation of this kind.

Advantages and Savings

The greatest advantage and saving through the use of this equipment for loading operations is the elimination of the checker, which makes it possible for one man to do the physical placing of the items on the conveyor and still maintain the same rate of production.

A smoother flow of merchandise into the truck is obtained because there is no time lost waiting for the checker to thumb through the many invoices to find the item to be called. This reduces considerably the waiting time of the other crew members. A speaker installed near the truck also enables the loader in the truck to anticipate in advance what will be received. He can build a better load pattern in the motortruck, thus reducing handling and intransit damage to the produce.

This equipment also introduces flexibility in the loading operations. No specialized men are required to check the loads and read invoices. Anyone who is familiar with the merchandise can pull the cord and locate and place the items on the conveyor as they are called. Starting time or the time required in preparing to

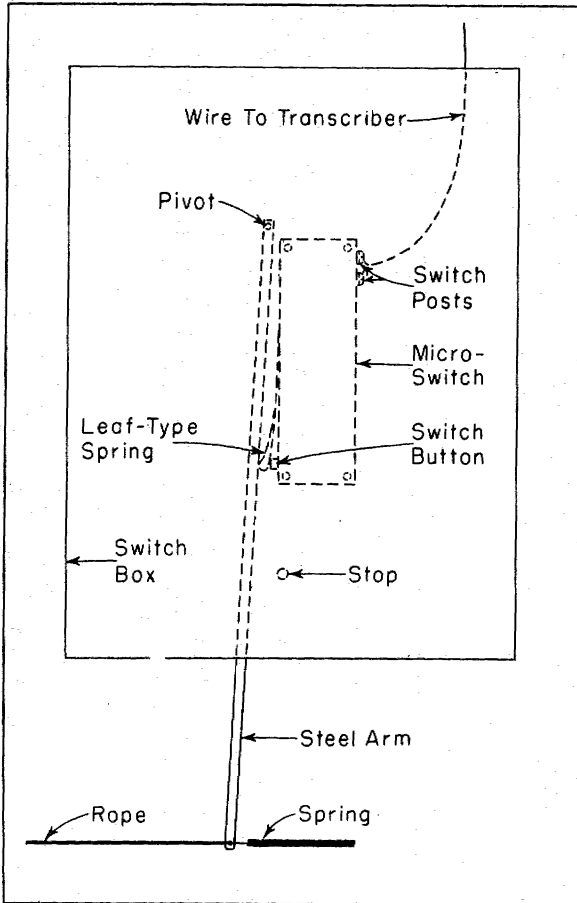


Figure 14.--Switch and auxiliary parts used in the electrical circuit for turning the transcribing machine off and on. (When the rope is pulled, a small steel arm, attached to the switch box, is moved away from the leaf-type spring, which in turn releases the switch button, completing the circuit and turning the transcribing machine on. When tension on the rope is released, the spring attached to the bar pulls the bar against the leaf spring, which in turn pushes and holds the switch button in the off position, breaking the circuit and cutting the transcriber off. The wire leading to the transcribing machine is connected with the switch posts.)

load is also reduced considerably. No one waits while the checker is getting the invoices ready for loading. With the use of recording and transcribing equipment, it is merely a matter of changing the memobelt, and this operation can be accomplished in a few seconds by one man. The worker who places items on the conveyor belt in the warehouse can rotate with the man in the motortruck, thereby introducing some variation in the work and reducing fatigue. The over-all loading time for a night's operation is affected by the cumulative effects of fatigue.

Special instructions for any specific item can be made before recording that item on the memobelt. This can be done by the clerk who makes the recording in the office.

During the daytime operations, any special instructions which might be required by the night crew can be recorded as they come to mind on a memobelt and thus transmitted to the night crew. This procedure eliminates the necessity of writing notes and other messages for such a purpose. The result is better coordination between the day and night crew at a very low cost.

Time studies made before and after the new method was installed showed that the loading phase of the operation required only two men instead of the original three to maintain the production rate of the original method. In addition, the time studies indicate that with practice and improved skill, the over-all time for the evening's loading operation can be reduced.

With the adoption of the transcribing and recording machines two fewer men were needed from a total of six men employed in the two loading

crews, or one man less from each crew. On the basis of a 40-hour week, this reduction in crew size resulted in a saving of 80 man-hours per week, or 33-1/3 percent of the time needed to load delivery trucks. Of course, in any operation where the checker's time does not amount to one-third of the total loading time, the percentage of man-hours saved through the elimination of the checker would be different. With an assumed wage rate of \$1.25 per hour, which is about average for the industry, the savings in labor costs for loading would amount to \$100 per week. This figure does not include the reduction of over-all man-hours for other phases of loading operations that was obtained through greater production with fewer men.

Because over-all time is decreased, overtime work is reduced. Operations can be started later at night, thereby minimizing the time that produce is exposed to heat or cold while in the motortrucks. Thus, produce is in the motortruck a shorter time and the danger of damage from exposure to the weather is less. The merchandise reaches the buyer in fresher condition. This should result in improved customer satisfaction.

In addition to the saving made in loading the trucks, time studies showed that some saving in the man-hours required for assembling the merchandise was realized because it was possible to hold the size of the assembly crew constant. There was no need, as in the old method, for the assemblymen occasionally to help the loading crew complete the loading of the motortruck in order to clear the assembly area for items to be loaded on another truck. This leads to better coordination between assemblymen and loaders, and no time is lost by either of the assembly crews for performing duties other than their own.

Cost of Recording and Auxiliary Equipment

Of interest to any dealer desiring to install this or similar recording and transcribing equipment is its cost in relation to the savings that it can bring about. In table 1 are presented costs, as of December 12, 1950, of the recording and transcribing equipment installed in the warehouse for this experiment.

Table 1.--List of recording, transcribing, and auxiliary equipment; units required, and cost of installation as of December 12, 1950 1/

Equipment	Units required	:	Unit cost	:	Total cost
	<u>Number</u>		<u>Dollars</u>		<u>Dollars</u>
Dictating machine	1	<u>2/</u>	340.00	<u>2/</u>	340.00
Transcribing machine	2	<u>2/</u>	340.00	<u>2/</u>	680.00
Pre-amplifiers	2		50.00		100.00
Reflex speakers	8		16.25		130.00
Start-stop switches	2		15.00		30.00
Microphone for dictating machine	1		20.00		20.00
Foot control switch for dictating machine	1		12.00		12.00
Dustproof covers for machines	3		1.25		3.75
Total	-		-----	<u>2/</u>	1,315.75

1/ Compiled from information furnished by the manufacturer.

2/ Does not include State sales tax and Federal excise tax.

Because of the size and length of this warehouse and the nature of the operations, it was necessary to install more equipment than might ordinarily be needed. In most facilities, less recording and transcribing equipment would be needed. In such cases, the system could be installed for about \$850, and, depending on the volume of merchandise moving through the warehouse, should be paid for out of savings in about 6 months. For example, most warehouses could get along with one transcribing machine instead of two, one pre-amplifier instead of two, four speakers instead of eight, and one stop-start switch instead of two, thereby keeping the cost below the figure shown in table 1.

THE REVISED METHOD IN A NUTSHELL

The recording method of loading as described in this report resulted in labor savings of \$100 per week in the loading phase alone. Wherever the checker is one-third of the loading crew, this saving would be a reduction of one-third in the labor cost of loading. Sizable savings in the other phases of the operation could be traced to the new method. The steps in applying recording and transcribing machines to the loading of motortrucks are illustrated in the figures below.

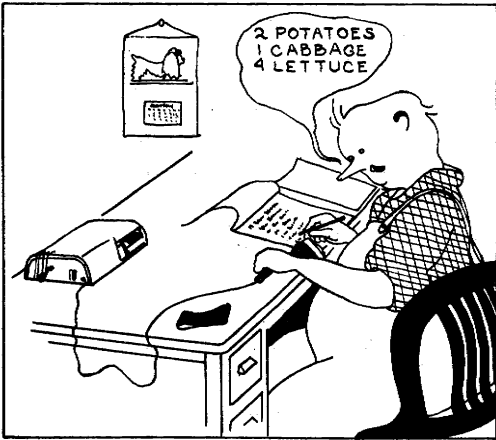


Figure 15.--An office clerk records onto a small inexpensive memobelt the items from the invoices for a motortruck load.

Figure 16.--After the recording has been made and properly marked for identification, it is carried to a member of the loading crew.

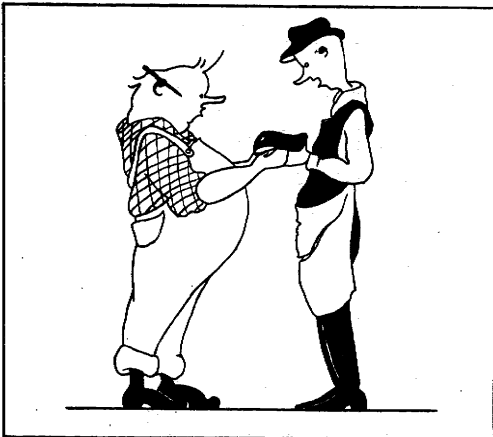
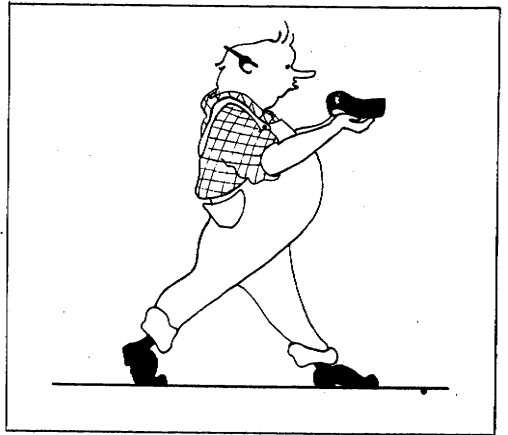


Figure 17.--The shipping crew member takes the recording belts and locates the proper load.

Figure 18.--The belt recording for the load is placed in the transcribing machine.

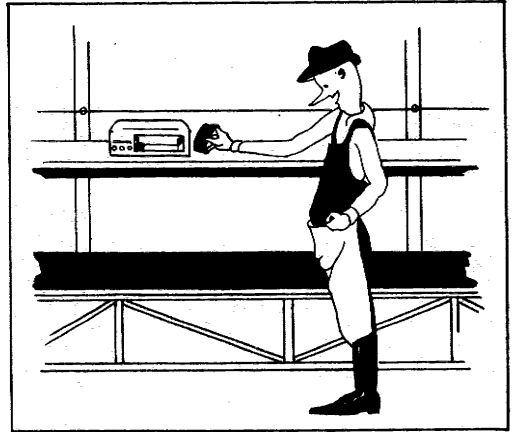


Figure 19.--A rope strung along the loading area is pulled to start the transcribing machine. The information contained on the belts comes over small speakers located within hearing distance. Releasing the rope cuts off the power.

Figure 20.--The man having heard two, three, or four items, proceeds to pick them up and places them onto a belt conveyor, which carries the merchandise into the truck.



The use of this recording and transcribing equipment eliminates the need for having a checker call the items to be loaded. It also eliminates the delays on the part of other members of the loading crew, which result from the difficulties the checker runs into when reading and fumbling through a group of invoices.