Mechanical Field Loading of Sacked Potatoes[1]

By

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One of the most difficult jobs in the harvesting of potatoes is to load the sacked potatoes onto trucks while the trucks are moving through the fields. This job requires a great deal of physical strength on the part of the men doing the loading. When loading by hand 4 or 6 men may be used in addition to the man driving the truck. Two men build the load on the truck and either 2 or 4 men lift the sacked potatoes onto the truck. Two rows of sacked potatoes are loaded simultaneously.

In an effort to lighten the task of loading sacked potatoes a mechanical field loader was designed, built, and tested under actual field conditions. The machine is suitable for loading one row of sacked potatoes at a time. When loading sacked potatoes with the mechanical loader three men are required in addition to the truck driver. Two men are used to build the load while one man rides on the loader and lifts the sacks from the ground to the sack elevator. This is a distance of about 10 inches. The sacks are delivered to the men on the load at a convenient height.

The loader consists of an elevator about 11.5 ft. long mounted across a four wheel trailer made from an old automobile chassis. The elevator is made of angle iron and conveyer chain normally used for conveying potatoes from the bin to cleaning and sorting machinery. Pieces of garden hose are bolted to the conveyer at 16 inch intervals to help elevate the sacks. The elevator is driven by a 1¾ H.P. gasoline engine. The drive goes through an automobile transmission. The purpose of the transmission is to act as a speed reducer, and also as a means of changing the speed of the elevator. When the transmission is in second gear the elevator has a speed of about 180 feet per minute. This speed is satisfactory.

The man that lifts the sacks from the ground to the elevator rides on the platform just ahead of the elevator. This man can easily do his job even when operating in a high yielding field where sacks are quite close together in the row. The platform and the lower end of the elevator are both adjustable vertically so that they can be set close to the ground when the machine is used for loading and raised for transporting.

The loader is attached to the truck being loaded by a special hitch arrangement. See Figure 2. It takes only a fraction of a

[1] Progress report on Purnell Project 131.
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minute to do this. Before this hitch was developed an attempt was made to pull the loader with a small tractor while the truck was being loaded. It was very difficult for the truck driver and the man driving the tractor to keep the two machines together. Attaching the loader to the truck worked well, except when operating in loose soil. Under these conditions excessive side draft developed and some difficulty in steering the truck was encountered. However, this is not considered serious in most cases.

In North Dakota most of the potatoes are dug with the two

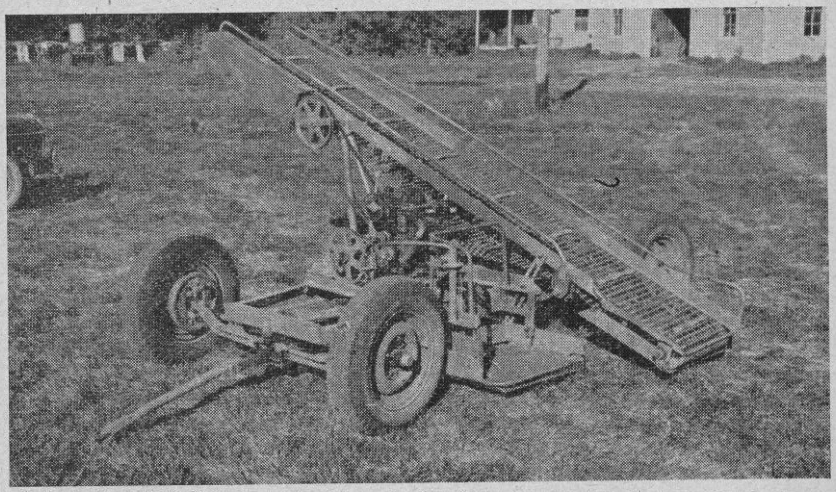


Figure 1—Machine for loading sacked potatoes.

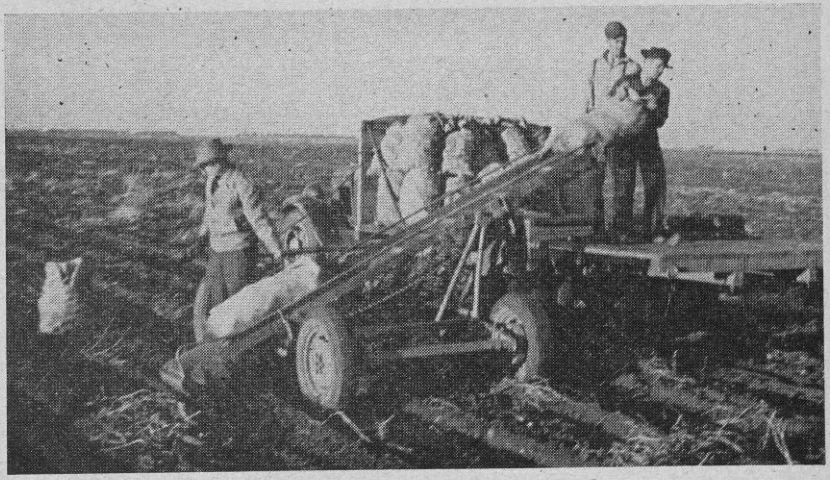


Figure 2—Mechanical loader in use. Pipe hitch can be seen at front of loader.

row mechanical diggers. The digger drops the potatoes from the two rows into one row on the ground. The potatoes are picked from the rows by hand. The picking crews work in pairs and pick the potatoes into 35 lb. baskets. Each picker picks from his individual row but each of them empties a basket of potatoes into a sack placed midway between the two rows of potatoes. This arrangement places the rows of potato sacks 13'-4" apart when the potatoes are planted in rows 40" apart, or 12' apart when the rows are 36" apart. A field of sacked potatoes is shown in Figure 3.

Loading must be started at the edge of the field. Since the rows of sacked potatoes are about 13 feet apart the loader elevator is not long enough to reach from one row across the next row and to the truck. If the elevator were about 16 feet long this would be possible and loading could be started at any point in a field of sacked potatoes. Lengthening the elevator would require some redesigning to insure proper balance.

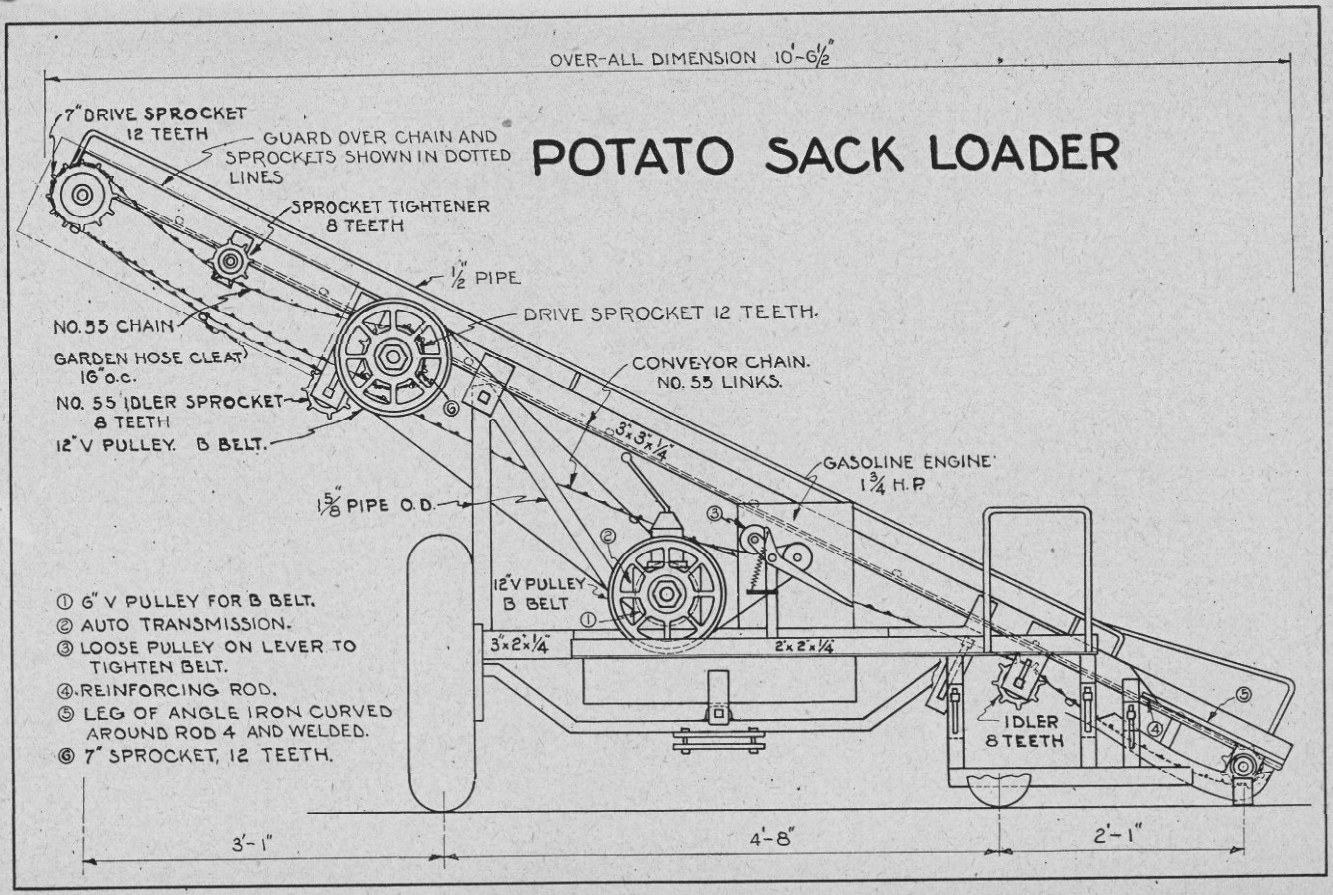
A number of tests were conducted to determine the rate of hand loading as compared to machine loading. The results of these tests are shown in Table 1.

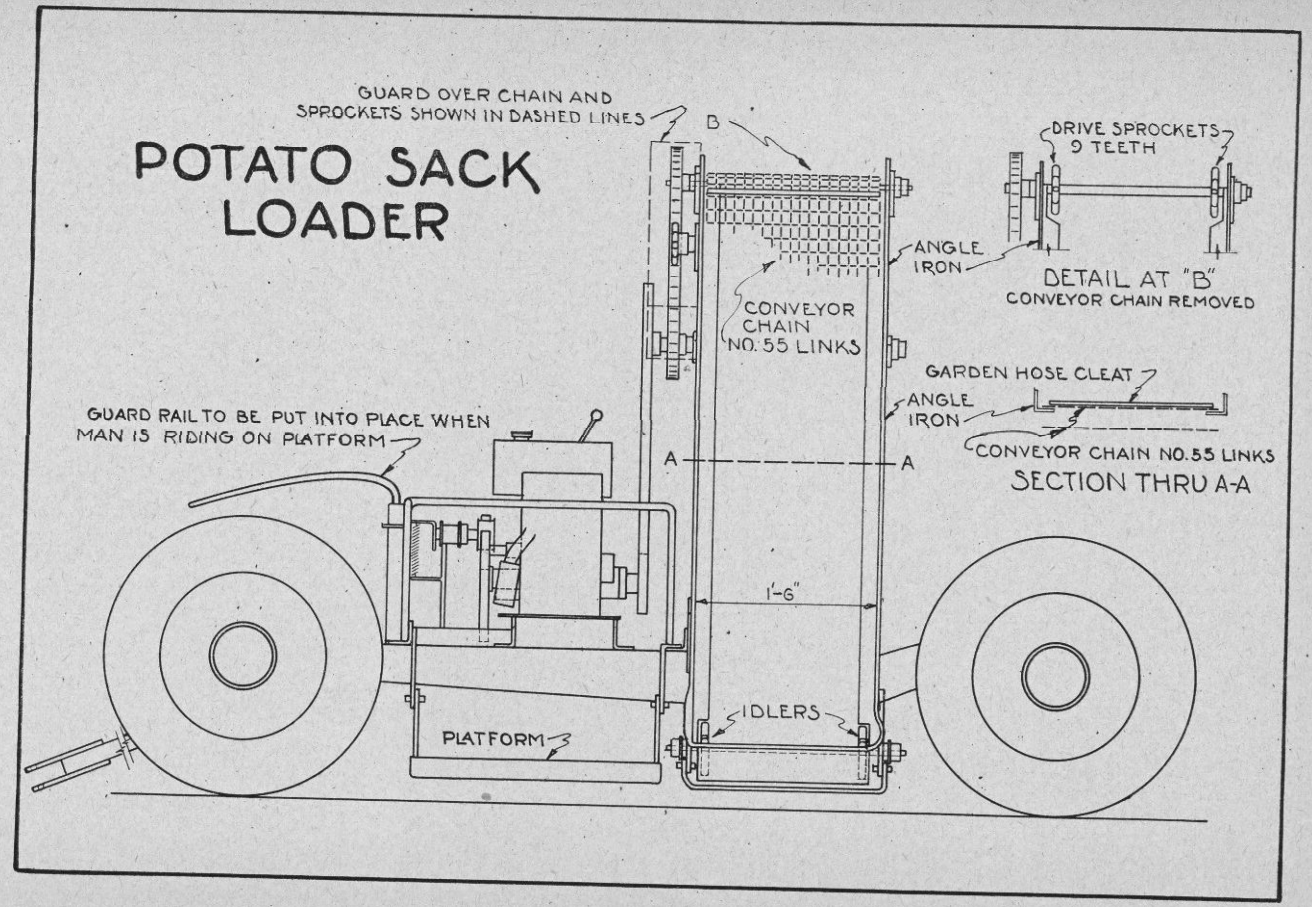
Figure 3—Field of sacked potatoes.

Table 1—Data on hand and machine loading of potatoes.

Estimated yield of Potatoes Bu. per acre	Sacks per min.	No. of men in loading crew	Sacks loaded per man per minute
	Hand Loading		
250	11.1	6	1.9
250	13.5	6	2.3
350	14.5	4	3.6
	Machine Loading		
250	12.6	3	4.2
250	15.0	3	5.0
300	7.5	3	2.5
150	6.0[1]	3	2.0

[1] Machine was operated in light, loose soil which caused side draft on the truck that was pulling the loader. This caused the loading to be slowed down considerably.


POTATO SACK LOADER
OVER-ALL DIMENSION 10'-6½"
7" DRIVE SPROCKET 12 TEETH
GUARD OVER CHAIN AND SPROCKETS SHOWN IN DOTTED LINES
SPROCKET TIGHTENER 8 TEETH
½" PIPE
DRIVE SPROCKET 12 TEETH.
NO. 55 CHAIN
GARDEN HOSE CLEAT 16" o.c.
NO. 55 IDLER SPROCKET 8 TEETH
12" V PULLEY. B BELT.
CONVEYOR CHAIN. NO. 55 LINKS.
3"x3"x¼"
GASOLINE ENGINE 1¾ H.P.
1⅝" PIPE O.D.
12" V PULLEY B BELT
3"x2"x¼"
2"x2"x¼"
IDLER 8 TEETH
① 6" V PULLEY FOR B BELT.
② AUTO TRANSMISSION.
③ LOOSE PULLEY ON LEVER TO TIGHTEN BELT.
④ REINFORCING ROD.
⑤ LEG OF ANGLE IRON CURVED AROUND ROD 4 AND WELDED.
⑥ 7" SPROCKET, 12 TEETH.
3'-1"
4'-8"
2'-1"


POTATO SACK LOADER
GUARD OVER CHAIN AND SPROCKETS SHOWN IN DASHED LINES
B
DRIVE SPROCKETS 9 TEETH
ANGLE IRON
DETAIL AT "B" CONVEYOR CHAIN REMOVED
CONVEYOR CHAIN NO. 55 LINKS
GARDEN HOSE CLEAT
ANGLE IRON
CONVEYOR CHAIN NO. 55 LINKS
SECTION THRU A-A
GUARD RAIL TO BE PUT INTO PLACE WHEN MAN IS RIDING ON PLATFORM
A
A
1'-6"
IDLERS
PLATFORM

Tests indicate that when loading by machine, more sacks per man per minute were loaded than when loading by hand. Crews that were used for loading by machine were regular loading crews and were not specially trained for the machine method of loading.

Some potato growers were quite enthusiastic about the machine, others felt that a machine should be developed that allows sacked potatoes to be loaded from both sides of the truck and still others felt that a mechanical harvester must be developed that will eliminate the sacking operation and will allow potatoes to be handled in bulk.

TREE RING STUDIES IN NORTH DAKOTA

"Tree Ring Studies in North Dakota" is the title of North Dakota Agricultural Experiment Station Bulletin No. 338 issued in April 1946. The author is Mr. Geo. F. Will, a business man of Bismarck, N. Dak. Mr. Will was led into a study of the growth rings on old trees, principally burr oaks and cedar, by a desire to determine the date of the existence of old Indian villages in this State.

He was fortunate in locating a burr oak tree some 373 years old, some six miles northwest of Bismarck, N. Dak. The tree was cut in 1940 and its rings counted and measured as to relative widths of rings, narrow rings being indicative of relatively dry years, and wider rings indicative of relatively wet years. This extended a weather calendar back to about 1567. Buried logs from old Indian village sites were then examined as to their growth rings. It was soon noted that their groups of wide and narrow rings could be matched with similar groups of rings developed in the earlier years of growth of the 373 year old tree. Following up this plan with still other logs a calendar of the seasons has been extended back to 1406 A.D. The longest relatively wet period, some 39 years. occurred in the period 1663 to 1702. The longest relatively dry period, some 16 years, occurred in 1633 to 1649. The study reveals no evidence of cycles or rhythm in the alternation of wet and dry periods. Copies of the bulletin may be obtained free upon request to the Information Department, State College Station, Fargo, N. Dak. Ask for Bulletin 338. (Reviewed by H. L. W.)