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THE IDAHO POTATO HARVESTER

by

J. W. MARTIN and E. N. HUMPHREY

UNIVERSITY OF IDAHO
Agricultural Experiment Station
DEPARTMENT OF AGRICULTURAL ENGINEERING

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SUGGESTIONS FOR REDUCING MECHANICAL DAMAGE TO POTATOES

I. HARVESTING

A. Type of Harvester.

1. The type of harvester to use depends upon labor available, capital, rocks, and soil conditions. The proper management of any machine will result in fewer injuries.
2. The single-row machine shown in Figure 2 caused less injury than picking by hand.
3. Single-chain diggers cause less injury than double-chain diggers.
4. Picking into sacks results in less injury than picking into baskets.
5. Trailer-type digger-pickers cause more injury than single-unit digger-pickers.
6. Combines with low drops between chains, slow chain speeds, elevators which will not allow tubers to roll back and will lower to within a few inches of the bottom of the truck bed are desirable over other types.

B. Management of Machines.

Much can be done with the harvesting machinery and equipment that is now in use on the farms to reduce harvesting damage to potatoes. The following suggestions, if properly observed, will reduce mechanical injury.

1. Dig deep enough to avoid cutting the tubers.
2. Reduce the field speed of the digger to 1½ miles per hour or less.
3. Reduce the digger chain speed to 150 feet per minute or less.
4. Operate the digger chain with the raised portion of the link ends on the underside or shield them with belting.
5. Replace the kickers with idler wheels if soil conditions permit.
6. Put rubber tubing on the digger chain links.
7. Eliminate all drops of more than 6 inches wherever possible.
8. Put padding on the sacking platform. Use sponge rubber ½ to ¾ inch thick and protect with canvas or old belting. Pad the inside of the sacking hopper with sponge rubber 3/8 inch thick. Rubber padding can be cemented directly to the iron by cleaning the surface thoroughly and using a good rubber cement.
9. Pad the bed of the truck on which potatoes are hauled. Sponge rubber covered with canvas is excellent. Straw covered with sacks is good, or even sacks alone help considerably.
10. Reduce the speed of any transfer or elevator chains to 70 feet per minute or less.

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THE IDAHO POTATO HARVESTER

J. W. MARTIN* and E. N. HUMPHREY**

Farmers in several counties in Idaho are using a large number of potato combines. These machines are either digging-sacking or digging bulk-handling units. In the various potato-growing sections, interest is toward some type of mechanization that will replace the laborious and expensive method of digging and hand picking. Mechanical harvesting of potatoes is desirable for two reasons:

1. Efficient hand laborers for harvesting potatoes are becoming increasingly difficult to find and hire.
2. Such harvesting would help reduce potato production costs.

Until recently, development of mechanical harvesting equipment has been left largely to the individual farmer. Practically all potato combines now in use have been built in the farm shop by the farmer or in a local job shop by the mechanic from ideas developed by the farmer. A few shops have expanded and are building a limited number of machines each year.

In 1947 the Idaho Advertising Commission and the Idaho Agricultural Experiment Station jointly sponsored a research project to study ways to improve mechanical harvesting, sorting, and grading of potatoes. At the start of the project, a survey was made to determine the approximate number of machines in use. The results are summarized in Table No. 1.

TABLE NO. 1

Use of Mechanical Potato Harvesters

	1945	1946	1947	1948	1949
Number of Harvesters in Use	283	419	759	1,200	1,450
Acres of Potatoes Planted	184,452	176,235	144,807	150,000	144,000
Acres of Potatoes Harvested Mechanically	9,765	17,275	31,175	60,000	72,000

The main approach to the problem of mechanical harvesting of potatoes was to give engineering assistance to individual farmers wanting to build a potato combine. The engineering assistance consisted of sketches, special equipment for field trials, rubber for padding the digger, piler, and chain links, and the use of special tools. The farmers furnished materials and labor and did the actual building of the machine. The engineer visited the farms several times each week during construction of the machine. By this arrangement different models and several machines of each model could be built and tested during one harvest season. Farmers were willing to give the plan a try.

*Agricultural Engineer, Idaho Agricultural Experiment Station.

**Formerly Associate Agricultural Engineer, Idaho Agricultural Experiment Station.

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Attacking the Problem

The problem was approached from two separate methods:

1. Improve the machines now on the farm
2. Build new and better machines using a principle for dirt and tuber separation that was entirely new and revolutionary in potato combines

Farmers cooperated and made trials under actual operating conditions. Improvement on machines already on the farms was made by giving advice and assistance in procuring and installing rubber padding so as to prevent bruising, putting rubber tubing over the chain links, and reducing operating speeds and field travel to a safe point. Figure 1 shows a few of the steps used in improving harvesters already built. Sponge rubber sheeting was used on the sacking platform, in the sacking hopper, on the potato piler, and in the unloading elevator on bulk handling trucks.

Some of the results of this part of the study were presented in Idaho Agricultural Experiment Station Bulletin No. 278, "Steps That Can Be Taken to Reduce Mechanical Damage to Potatoes at Harvest Time."

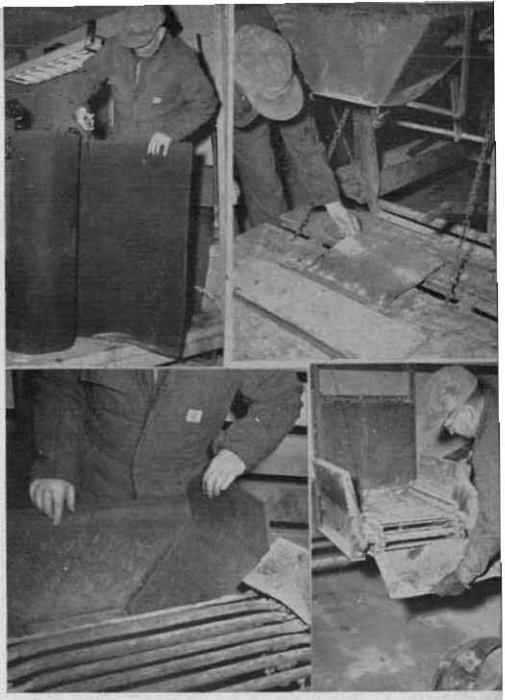
An entirely new separating mechanism was devised that would separate dirt from potatoes more effectively and do it without injuring the potato. Dirt separation from potatoes had previously been done on a vibrating chain belt. The new method used rubber rolls to separate dirt from the stream of potatoes. The advantages are:

1. Gentler action and practically no potato injury
3. Greater separating capacity per square foot
3. More positive separating
4. Better operation under damp and muddy conditions

Farmers wishing to incorporate the new principle into a potato combine were given assistance by furnishing drawings, plans and specifications, calculating sprocket sizes and speeds, assisting in obtaining rubber of correct specifications, and in securing aluminum channels of proper weight and size.

Many attempts have been made to build a successful potato combine. Success has been partially attained in some sections; but a machine that would harvest with success under average conditions encountered in all regions had not been built up to the time of this program. The combines in use bruised and damaged the potatoes and were unable to operate successfully under muddy and cloddy conditions.

Farmers were conscious of these problems and welcomed the assistance of an engineer. Many requested assistance and advice as to machine operating speeds, field speeds, and shielding to reduce tuber



— Using sponge rubber to prevent and
ruising of the potatoes. Upper left—the
ber as used on the experimental ma-
Upper right—padding the sacking hop-
using a cushion under the sacks as they
ng filled. Lower left—inside view of
ing hopper. Lower right—padding the
elevator of a bulk handling truck.

. A few had confidence in the new principle of operation in-
rated into an experimental machine built on the Aberdeen Experi-
Station. Farmers also requested engineering aid in designing
uilding two-row bulk-harvesters as well as single-row machines.
were formulated and drawings prepared using the new prin-
in both sacking and bulk-handling models of machines in sizes
ate for any farm producing potatoes commercially. All aid re-
ed was given as far as possible, with the result that many old
ines operated more satisfactorily and four models incorporating
ew design were developed.

uring the first year of the project, all efforts were directed to-
designing the single-row sacking machine for trials on the Uni-
ty of Idaho Aberdeen Branch Experiment Station. After a care-
tudy of the desirable features the following principles were set
r the design:

1. Separate the soil from the potatoes on rubber rolls after they had traveled up a rubber-coated digger chain
2. Keep the potatoes on rubber from soil to sack
3. Use rubber padding to cushion the potatoes
4. Use rubber tubing cemented to the digger chain links
5. Allow the potatoes no free fall of more than 6 inches
6. Reduce the operating speed and carry a cushion of soil up the digger chain

uring the winter months, plans were drawn covering the basic
gn for four models of potato harvesters. These machines were
gned to operate on small and large farms and to operate under
erse as well as favorable conditions. These machines were named
ollows:

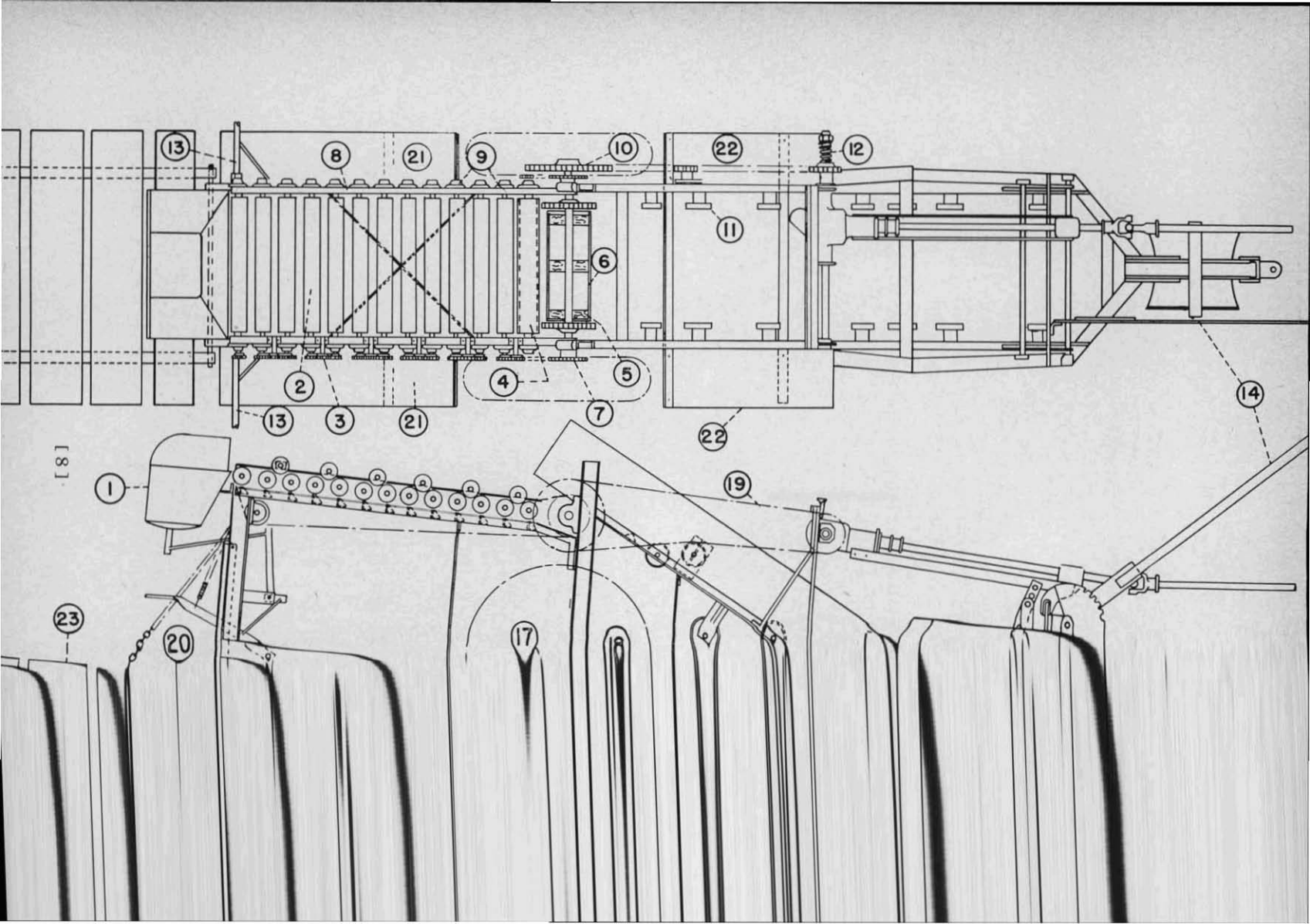

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Figure 3. Construction details of the single-row sacking model. (Top) Plan view showing the relation of the digger chain, rubber separating rolls and sacking attachment. (Bottom) Side view showing the relation of the work platforms, separating rolls and sacking attachment. (These drawings are furnished to Idaho farmers to guide in the building of a potato digger for their own use.)

1. Sacking hopper, padded with 3/8 inch sponge rubber.
2. Rubber sorting rolls. Original model used 6 smooth rolls and 1 star roll. Later design specified 12 smooth rolls and 1 star roll. Rolls spaced 1¼ inches apart. See Figure 5 for details.
3. Drive sprockets, 10 teeth. Idler sprocket, 9 teeth. High speed roller chain to drive the rolls.
4. Star roll. See Figure 5 for details.
5. Wood disc to be used as hubs in a resilient drum to prevent rocks from sticking in the digger chain.
6. Rubber belt to cover the wood disc. This forms a drum and keeps rocks from wedging between digger chain links and damaging the star roll.
7. Drive sprocket for separating roll assembly.
8. A 4-inch channel iron to provide support for the roll assembly.
9. Sealed ball bearings.
10. Main drive sprocket.
11. Digger chain idler sprocket.
12. Slip clutch.
13. Arm for carrying a supply of empty sacks.
14. Depth control lever.
15. Press wheel, also depth gauge.
16. Hinge joint.
17. Axle clamp, adjustable for machine balance.
18. A 4-inch steel channel.
19. Main drive chain.
20. Sponge rubber pad under the sacks.
21. Two-inch plank for the picker platform.
22. Vine picker platform.
23. Sacker platform.
24. Angle iron brace.
25. Operating speeds.
    a. Field speed 1½ m.p.h.
    b. Digger chain 132 to 150 feet per minute.
    c. Rubber rolls 90 to 150 r.p.m.
    d. Surface speed of star rolls same as digger chain, 132 to 150 feet per minute or slightly more.

Figure 4. Showing the construction of the rubber separating rolls. This view shows the star-roll mounted next to the digger chain and the six rubber rolls. Note the rubber shields over the digger chain ends and the padding over the end of the rolls. This padding helps reduce mechanical damage to the potatoes. Also notice that the roll drive chains are covered with a metal shield so no one can be injured.

In Figure 5:

1. Idler sprocket, 9 tooth.
2. Drive sprocket, 10 tooth.
3. Sealed ball bearing.
4. Wood spacer, 1¼ inches thick.
5. Iron collar spot welded to the shaft.
6. Iron washer.
7. A 1-inch steel shaft.
8. A 4-inch channel iron.
9. Cleaner bar 1½ x ¼ inches.
10. Rubber washer 1 inch inside diameter and 3 inch outside diameter by 1/8 inch thick.
11. Star washer 3¾ inches outside diameter, 18 points by 1/8 inch thick. Star roll alternates 2-star washers with three or four plain washers.
12. The 18 roll assembly fits the two-row light duty harvester. This assembly does not use the star roll.
13. The 13 roll assembly fits the single-row bulk handling harvester. This assembly does not use the star roll.
14. The 13 roll assembly using one star roll fits the single-row sacking machine and the two-row heavy duty machine.

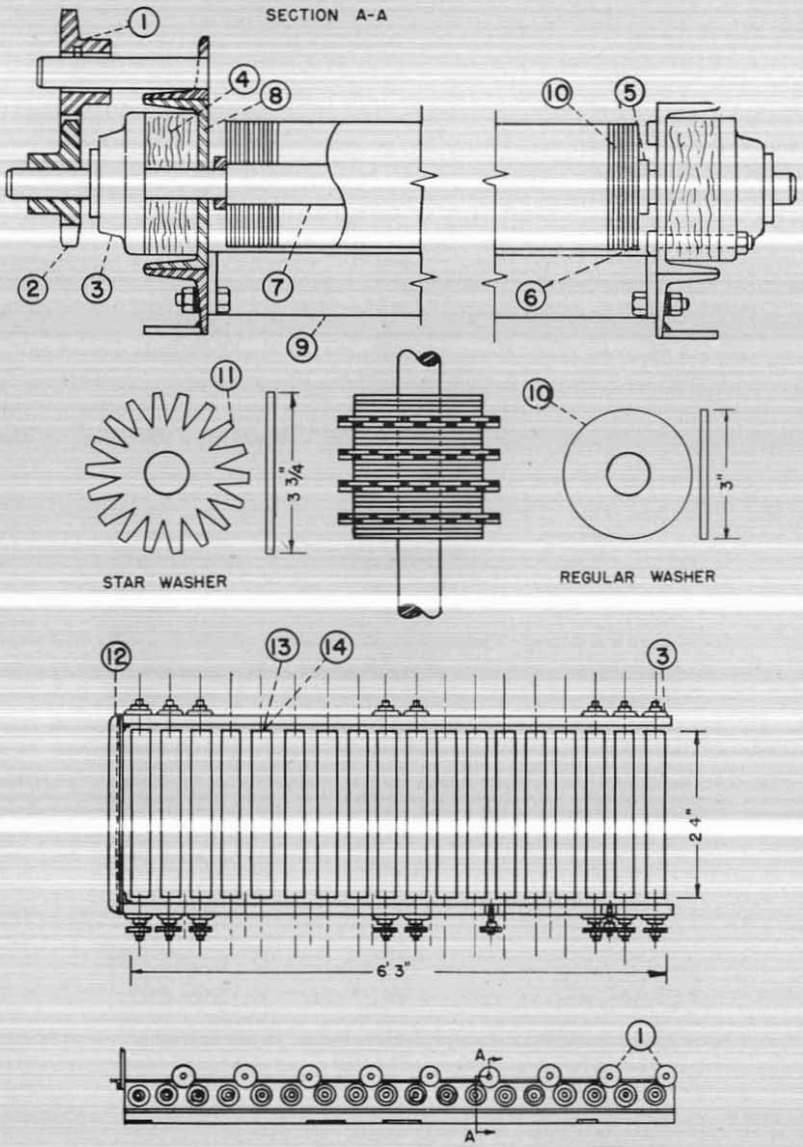


Figure 5. Construction details of the rubber separating roll assembly. (These drawings are furnished to Idaho farmers to guide in the building of a potato digger for their own use.)

Sacking hopper — The sacking hopper is lined with sponge rubber sheeting 3/8 inch thick. The details of construction are shown in Figure 6. The distance from the bottom of the hopper to the platform on which the sack rested while being filled is 24 inches.

Sacking platform — The sacking platform was made adjustable for height and hinged so that it would fold upward in case it struck an obstruction. The size of the platform was 53 by 40 inches. It was made by bolting 2 inch planks on a light metal frame and designed to carry the weight of the man operating the sacker as well as the weight of the sack of potatoes.

Single-Row Bulk-Handling Machine

Many farmers are finding it a great saving in time and expense to handle their potato crop in bulk. To provide a machine that will do this for the smaller operator, a one-row unit was designed to be used with a small cultivating-type tractor. Operated at a field speed of 1½ m.p.h., this machine will harvest ½ acre per hour or from 4 to 5 acres per day.

This potato combine was designed to work with a tractor having a high rear axle. The small tractor can pull the machine and operate the digger chain, separating rolls, and elevator from the power take-off shaft in average digging conditions. Figure 7 shows the complete machine ready for field trials.

Aluminum framing members were used in the separator and elevator to reduce weight. The entire elevator weighs only 470 pounds. The reduction in weight was necessary to facilitate steering. The weight of the harvesting mechanism was carried on two rubber-tired caster wheels on the rear of the machine.

The digging operation is performed under the center of the tractor, and the height of the digger points is controlled by the hydraulic system of the tractor.

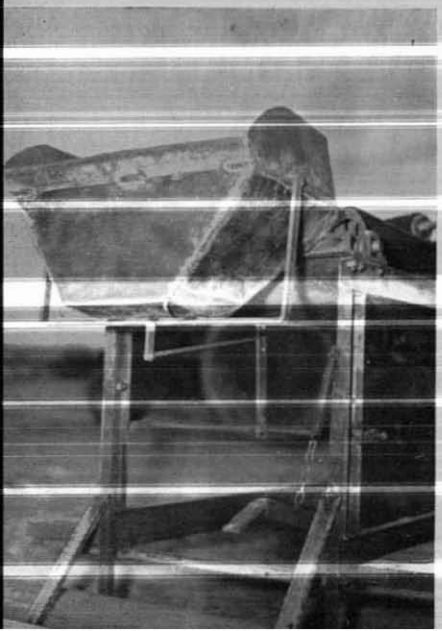


Figure 6. Sacking hopper as used on the single-row sacking harvester. The hopper is lined with sponge rubber. It is tripped by a foot lever. The hopper holds a half sack of potatoes. They are allowed to accumulate while the sack is being changed.

The separator assembly is composed of 13 smooth rubber rollers mounted across the rear of the machine as shown in Figure 7.

In this machine the rolls moved the potatoes from the digger chain to the elevator as the dirt was eliminated. The rolls were 3 inches in diameter and each turned at the same speed. A rear platform was provided for one or more operators to pick clods and rocks from the potatoes as they moved to the elevator. The rubber rolls were driven at 90 to 150 r.p.m. which gave a surface speed of from 70 to 120 feet per minute. With this arrangement, the rubber rolls will eliminate dirt and the short stems and will break up the softer clods. Only the hard clods and rocks must be picked out of the stream of potatoes. Figure 8 is another set of pictures showing how the machine was constructed.

The original machine was designed to be operated from the power take-off. However, after the first season's trial it was found that a separate engine would be an advantage. One 9 h.p. engine could operate the entire harvester mechanism. If more flexibility was required, two engines could be used, one to drive the digger chain and one small engine to operate the elevator and separating rolls. This would increase the over-all weight of the machine but would allow reserve tractor power for wet and muddy field conditions. It would also give better speed control which is always an advantage in keeping bruises at a minimum. Figures 9 and 10 are sketches showing how the machine was built to fit the small tractor.

The machine was designed for a field speed of 1½ m.p.h. and a digger chain speed of 132 to 150 feet per minute. The cost for the material used in building the machine was about $500.00. The out-of-pocket expense in harvesting potatoes was about 6 cents per 100 pounds.

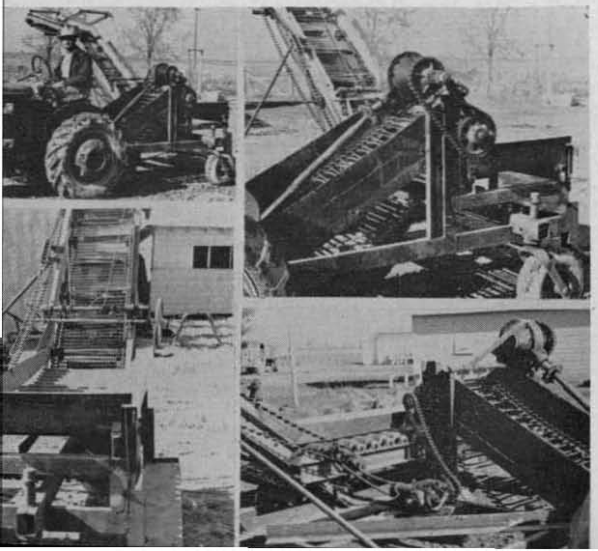


Figure 7. Single-row bulk harvester. Upper left — machine ready for the 1949 harvest. Upper right — the power take-off drive, digger chain and caster wheel. Lower left—separating rolls, caster wheel, rear platform and elevator. Lower right — elevator drive.

Figure 8. Single - row bulk harvester. Upper left — rubber separating rolls mounted across the rear of the machine. Note the method of driving the rolls and rubber belting used to protect the potatoes from injury. Upper right—the digger point mounted under the tractor. Lower left—the rubber separating rolls. Note the relation of the digger chain to the roll assembly. Dirt separation takes place over the rolls and the potatoes are moved to the elevator and into the truck. Lower right — view showing the digger chain, caster wheel and power take-off drive.

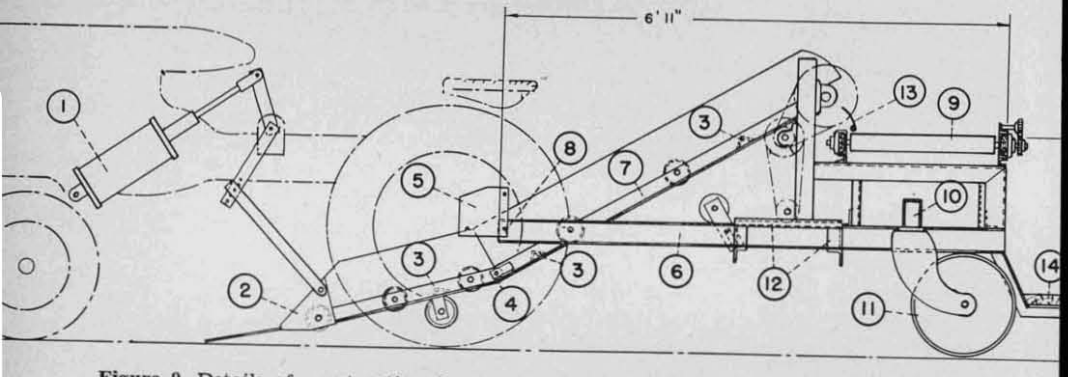


Figure 9. Details of construction for the single-row bulk harvester. (These drawings are furnished to Idaho farmers to guide in the building of a potato digger for their own use.)

1. Hydraulic lift for the digger point.
2. Digger point. Either a solid or a split point can be used.
3. Angle iron tie brace.
4. Hinged joint in the apron.
5. A ½-inch mild steel plate.
6. A 4-inch mild steel or aluminum channel iron.
7. A 2 x 1½ inch angle iron ¼ inch thick.
8. Hinged tractor mount.
9. Separating roll assembly using 13 smooth rubber rolls.
10. A 4-inch channel iron for caster wheel support.
11. Rubber tired caster wheel.
12. Support for 9-12 h.p. air cooled engine.
13. Spring loaded baffle board to prevent rocks from getting under the digger chain.
14. Operator's platform along rear of the machine.
15. To be used with a high rear axle tractor. Harvester designed for rows 36 inches or 38 inches apart.
16. Operating speeds:
    a. Field speed 1½ m.p.h.
    b. Digger chain speed 132 to 150 feet per minute.
    c. Rubber roller to operate at 90 to 150 r.p.m.

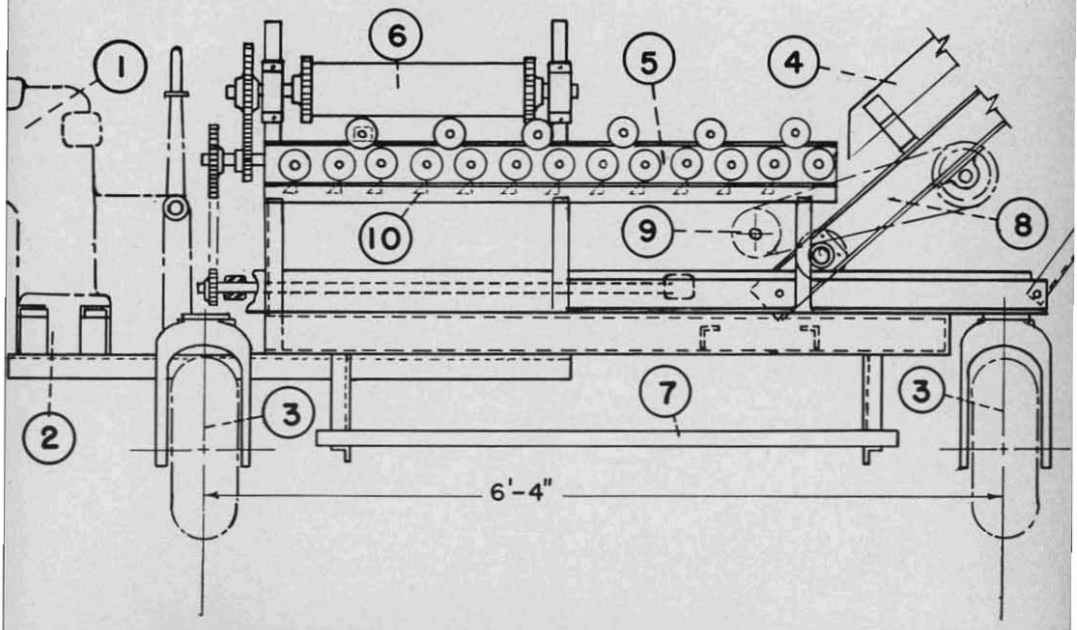


Figure 10. Rear view of single-row bulk harvester. (These drawings are furnished to Idaho farmers to guide in the building of a potato digger for their own use.)

1. Air cooled 9-12 h.p. engine.
2. Support and mount for engine. The weight of engines counter balances the weight of the elevator.
3. Rubber tired caster wheels.
4. Guard rails on the sides of the elevator.
5. Separating roll assembly using 13 smooth rubber rolls.
6. Enclosed drum to prevent rocks from breaking digger chain.
7. Operators platform on rear of the machine.
8. A 4-inch aluminum channel for the sides of the elevator.
9. Elevator drive. Protected with a slip clutch.
10. 1½ x ¼ angle iron cleaner bars keep the rolls free of mud.

Two-Row Light Bulk Handling Machine

This machine was built in two different models. The original model used a two-row standard digger for the basic frame with the rubber separating rolls mounted across the back of the machine as shown in Figure 11.

The second model was designed without reference to any existing machine; however, the two models are similar in actual construction. Figure 12 shows the frame as built by the cooperating farmer ready for the rubber rolls and elevator.

The machines were intended to operate in the lighter soil condition where rocks were not a major problem. The recommended field speed is 1½ m.p.h. At this speed the machine will dig and elevate an acre of potatoes per hour in fields producing 200 to 400 sacks per acre. From field trials we have found that the rubber roll assembly

operates better on a heavy yield than on a light yield of potatoes, and the machines equipped with the rubber roll assembly could operate in muddier conditions than machines using standard digger chains for dirt separation. In addition, rubber roll separation gave much less mechanical damage than separation on vibrating chains.

The harvester is powered by two small engines, one of 9 h.p. to drive the digger chain and a second engine to drive the elevator and rubber rolls. The throttle and clutch controls are located on the rear so that one man on the rear platform can control both engines.

Both models of the light duty machine used a rubber-roll separating unit consisting of 18 smooth rolls and with every roll driven at the same speed. The machines were intended to work in fields that had been de-vined. There was no provision for vine removal on the digger apron of the machine, but a work platform is provided at the rear for two or three operators to work. These men can remove rocks and aid in smashing the hard clods.

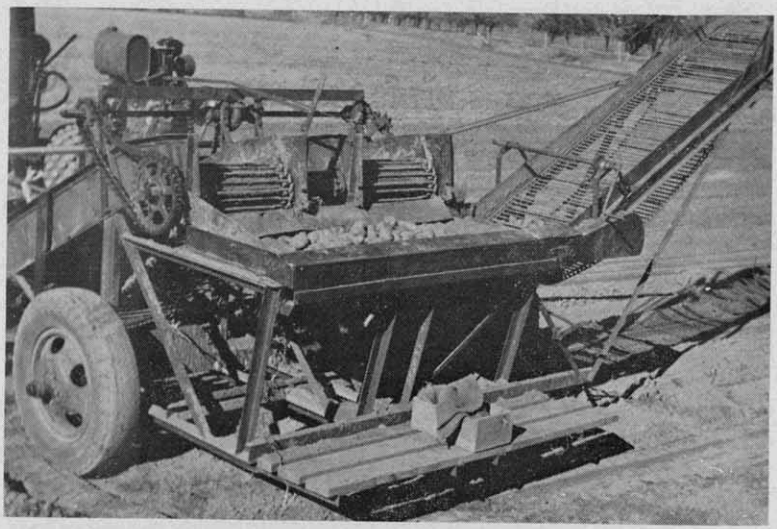


Figure 11. Two-row light duty bulk handling harvester. Note the relation of the separating rolls to the digger chain and elevator. Work space has been provided for three workmen.

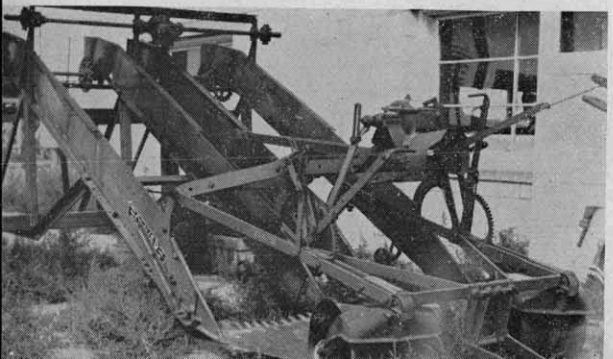


Figure 12. Frame for the two-row light duty harvester.

Figure 13 shows two views of one model of the two-row light duty machine. This machine has mechanical control for the digger point rather than hydraulic control. Either method is satisfactory. This machine is equipped with a solid digger point. A split digger point can be used if alfalfa roots present a problem. The machine is powered by two single-cylinder engines mounted as shown. One engine drives the digger chain and the other engine drives the elevator and separating rolls. This method gives good speed control. Less bruising will take place if the elevator is run at a speed so that the elevator chain is carrying a solid stream of potatoes rather than a few. The digger chain speed can be regulated so that the cushion of dirt is carried to near the top of the digger chain. A small platform can be built on each side of the machine for an operator if vines, rocks and hard clods present a problem.

Figure 14 is a close-up view showing how the axle was mounted to the wheels. Also how the small engine is connected to a speed-reducing unit to control the speed of the elevator.

Figure 15 is a sketch giving construction details and shows the relation of the digger chain, rubber rolls, elevator and engines.

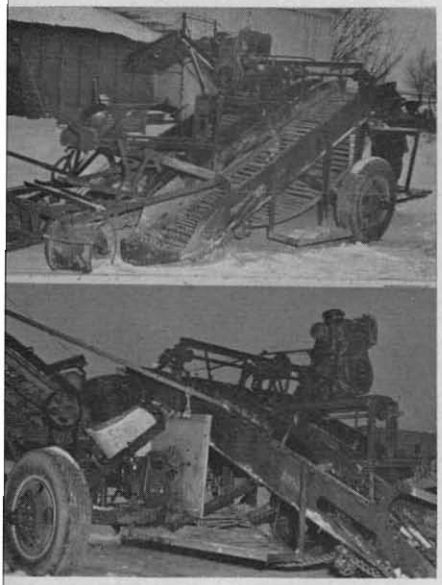


Figure 13. Two-row light duty machines. The top view shows the depth control device, the digger chain and the large single cylinder engine. The bottom view shows the small engine used to drive the elevator and roll assembly.

Figure 14. Close-up showing method of attaching the axle to the wheels and of mounting the small engine.

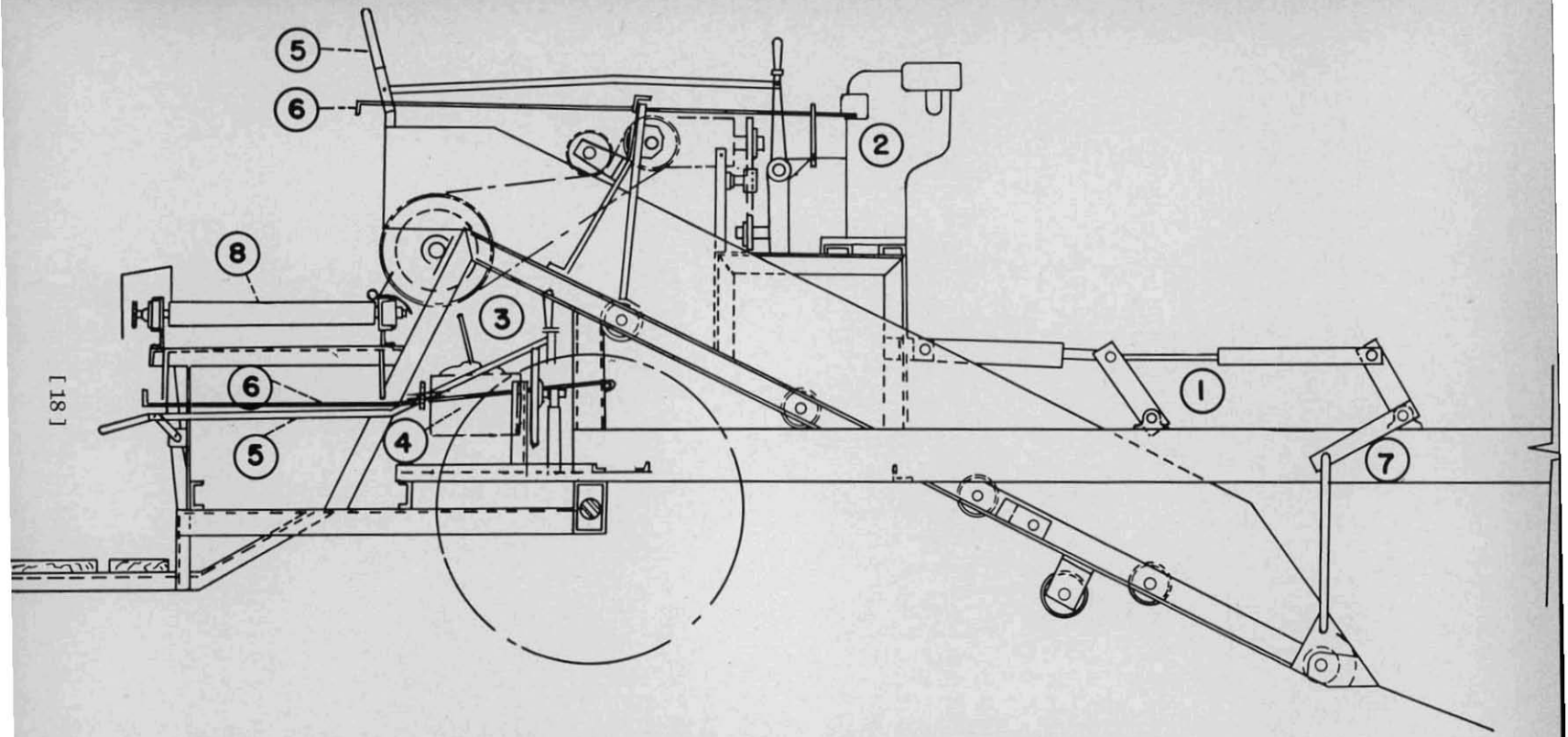


Figure 15. Two-row light duty bulk handling harvester. (These drawings are furnished to Idaho farmers to guide in the building of a potato digger for their own use.)

1. Hydraulic lift for depth control and road transport.
2. Air cooled 9-12 h.p. engine for digger chain and separating rolls.
3. Air cooled 3-5 h.p. engine for the elevator.
4. Gear reduction unit.
5. Clutch control lever for air cooled engine.
6. Throttle control lever for air cooled engine.
7. Channel iron main frame.
8. Separating rolls. Eighteen smooth rubber rolls mounted at the rear of the digger chains.
9. Operating speeds:
   a. Field speed 1½ m.p.h.
   b. Digger chain speed 132-150 feet per minute.
   c. Speed of rubber rolls 90 to 150 r.p.m.

The completed machine weighed almost 5,000 pounds, and, if in current production, could be expected to sell for about $2,500. Records kept on the machine's operation show a 1948 cost of 10 cents per 100 pounds for harvesting the potatoes and putting them into the cellar. This is a substantial saving over the operation done with hand labor.

Two-Row Heavy Duty Bulk Handling Machine

This machine was designed for severe operating conditions where rocks and clods are a problem.

The machine was built using the same basic principles as set up for the single-row sacking unit. It is essentially two single-row sacking units mounted side-by-side with a cross elevator to carry the potatoes into the bulk handling truck. Figures 16 and 17 show the machine as it was being built. A special split digger point was used on this machine to aid in digging operations when alfalfa roots were a problem.

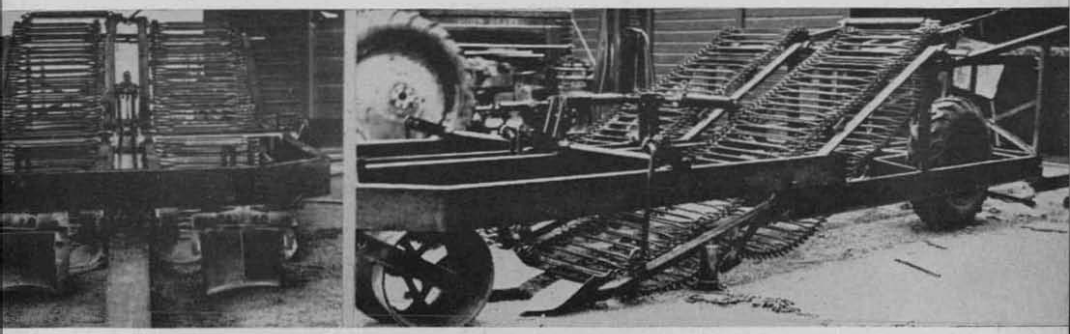


Figure 16. The two-row heavy duty machine under construction. Note the construction of the frame around the rear wheel to allow room for additional operators. A split digger point was used on this machine. The separating rolls were mounted directly behind the digger chains.

Two sets of rubber separating rolls were installed on the machine as shown in Figures 17 and 18. These rolls consist of 12 smooth rollers and one special star roller. To provide space so that operators could work at the sides of the machine, the left main wheel was set under the machine and a platform built on each side and across the back. These platforms provided space for at least three persons on each side and three persons on the rear or a total of nine for picking if severe conditions were encountered.

The original machine was operated by using one 4-cylinder, 21 h.p. combine engine as shown in Figure 18. In other models the power was supplied by two smaller engines. A 12 h.p. engine was used to drive the digger chains and a 3 h.p. engine operates the elevator and separating rolls. This arrangement allows for better speed regulation and reduces mechanical injury to the potatoes.

Figure 16 shows a front view and a side view of the machine as it was being built. Note the heavy frame extending around the digger.

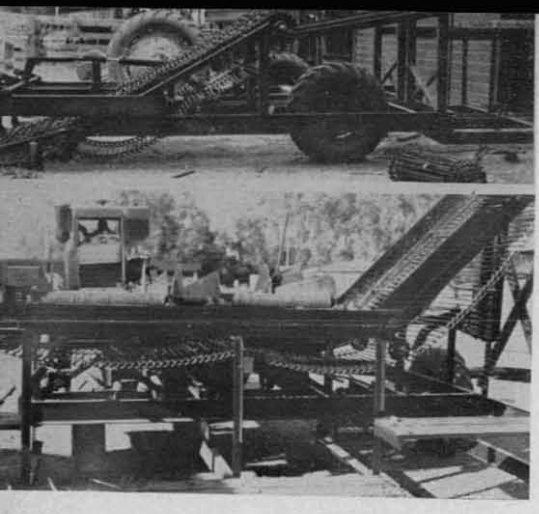


Figure 17. Two-row heavy duty machine under construction.

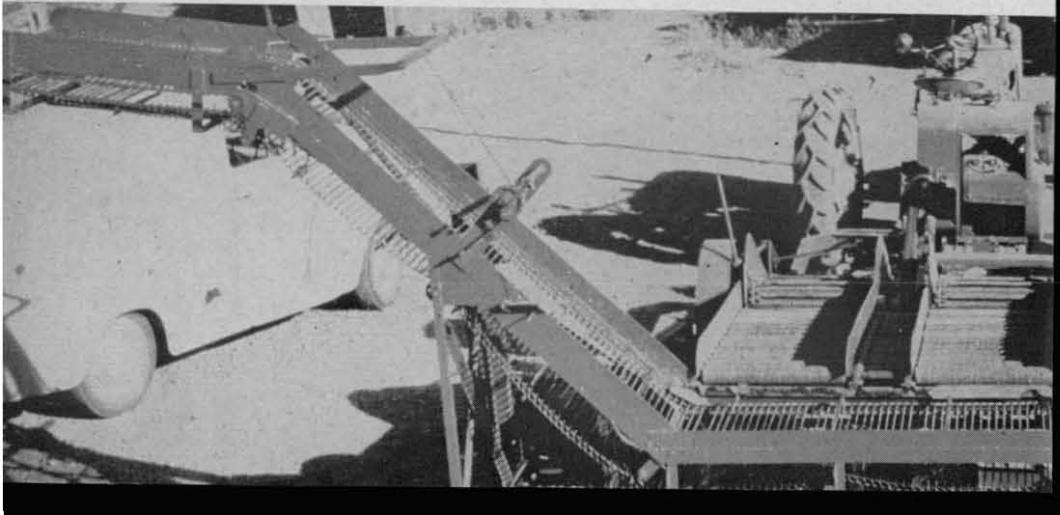
Also note how the left wheel was set inside the frame to provide space for operators to ride. These operators remove vines, clods and rocks. The digger point is controlled by hydraulic cylinders. When the machine is moved between fields the digger points are raised to a position between the framing members.

Figure 17 shows another side view and a rear view of the machine. The separating rolls discharge the potatoes onto a cross conveyor that is part of the elevator chain. The working platform can be seen extending around the machine. The throttle and clutch levers for the engines extend to the rear platform so that one operator can control the speed of the digger chain as well as the speed of the cross-conveyor and elevator.

Figure 18 shows the completed machine. The relation of the digger chains, separating rolls, cross-conveyor and elevator can be seen. This picture also shows the 21 h.p. combine engine used on the first machine.

Figure 19 is a sketch showing construction details and gives the relation of digger, separator, and cross-conveyor and elevator. The sketch also shows the location of the hydraulic cylinders and engines.

Figure 18. The two-row heavy duty harvester. Note the one large 4-cylinder engine and the location of the separating rolls.



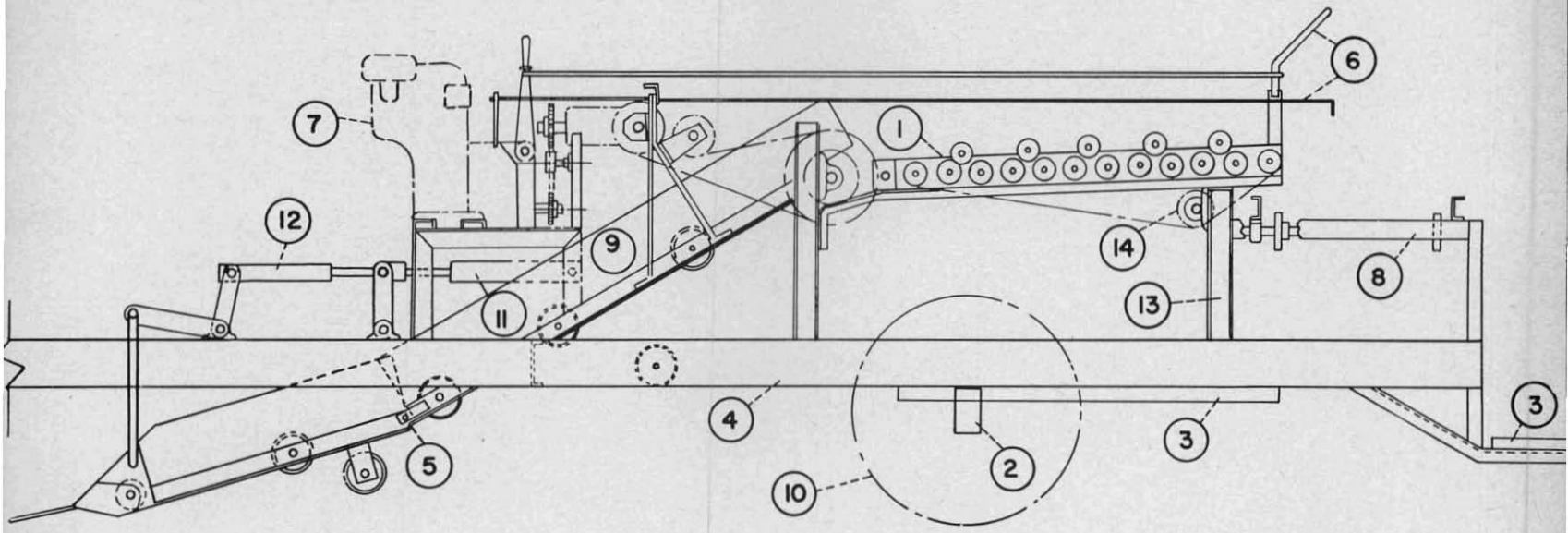


Figure 19. Construction details of the two-row heavy duty harvester. (These drawings are furnished to Idaho farmers to guide in the building of a potato digger for their own use.)

1. Separating rolls. Thirteen roll assembly using 1 star roll.
2. Two 6-inch channels welded together to form the axle.
3. Plank platform on sides and back.
4. Side member made from 6-inch channel iron.
5. Hinged joint in digging elevator for depth control.
6. Clutch and throttle controls for engine.
7. 12 h.p. engine to operate digger chain.
8. Elevator chain to operate 70 feet per minute. Power supplied by 3 to 5 h.p. single cylinder engine to operate the elevator and separating rolls.
9. Sides made from mild steel plates ⅛ x 12 inches.
10. Heavy duty rubber tired wheels.
11. Hydraulic cylinder.
12. Linkage member used in raising and lowering the digger point.
13. A 3-inch channel iron.
14. Drive for roll assembly. Roll assembly and elevator driven by a separate 3 to 5 h.p. engine.

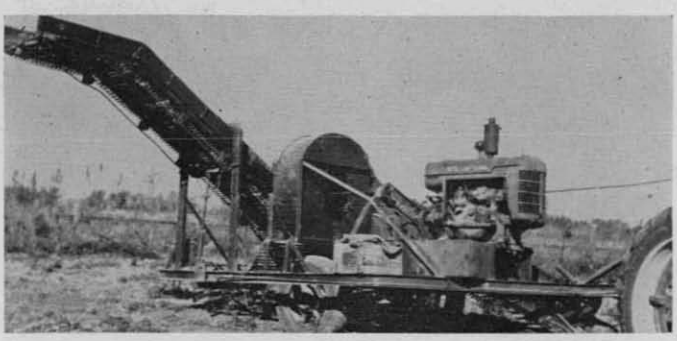


Figure 20. Potato harvester using a blower to remove vines by means of a blast of air. Power to operate the machine is from a 4-cylinder engine mounted as shown.

The farmer building the original machine spent $1,200 for material in addition to the engine and units available on the farm. He spent 6 weeks making the machine with the help of the agricultural engineer.

The advantage of this machine to the farmer was that potato harvesting can now be a family affair. He is not dependent upon itinerant workers. His wife drove the tractor; one man drove the bulk truck, and the farmer, with the help of the four neighbor girls, operated the harvester. The girls learned to operate the machine during the time the farmer spent in storing the potatoes in the farm cellar. Potatoes can be put into storage easier and cheaper by machine harvesting than by hand methods. In addition, at the end of each day's work the potatoes dug are in the cellar. None are left in the field to get wet or freeze.

Figure 21. A self-propelled harvester using two engines. One engine to move the digger and the other to operate the digger chains and elevator.

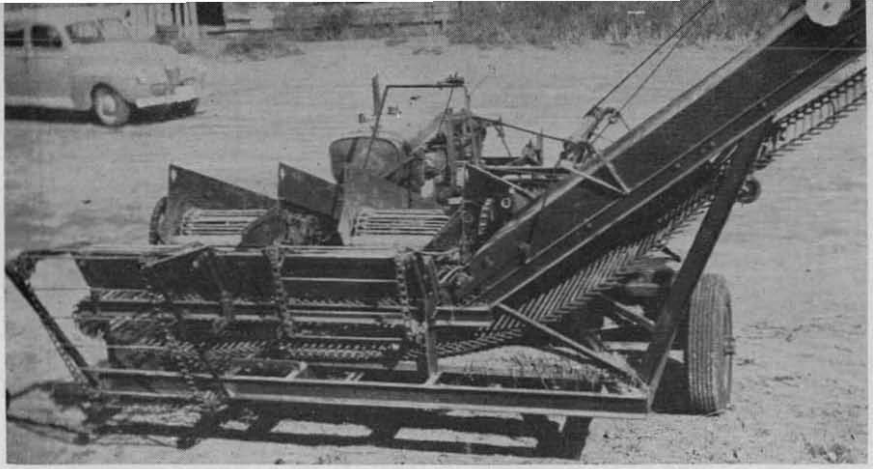


Figure 22. A two-row harvester with a special vine eliminator. The vines are carried over the rear of the machine and dropped on the ground.

Farmer-Built Potato Harvesters of Successful Design

Many harvesters that embody original and practical designs are in use in Idaho. Since there is no one standard design, each machine is different and reflects the ideas of the builder. They all harvest potatoes at a substantial saving in time and money over the old digging and hand picking methods.

The following pictures are presented to show the wide range of ideas that are in use. They show that a successful potato harvester is a complicated machine and that no one machine can meet all the requirements of capacity, speed, convenience, soil, rocks and climate. Some operators want a self-propelled unit. Others are interested in vine removal, while still others want to make a turn at the end of the field and dig the adjacent row.

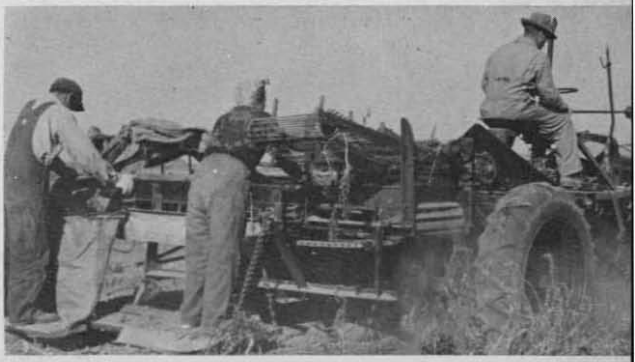


Figure 23. A self-propelled digger-sacking unit.

Figure 24. A bulk harvester with specially built elevators that enables the digger to operate on adjacent rows.

11. Put rubber tubing on all transfer and elevator chains.
12. Handle potatoes with care.

C. Clod Removal.

1. Harrowing just prior to harvest reduces the number of clods and helps remove vines. Harrowing plus a very light irrigation reduces the amount of clods.
2. Keep machinery off the fields during the growing season as much as possible, the fewest number of cultivations resulted in the fewest clods.

II. HANDLING FROM FIELD TO STORAGE

A. Type of Cart or Truck.

1. Depends upon the type of harvesting operation in use.
2. The truck bed should be as low as practical.
3. The truck bed should be padded.
4. The truck should have springs and pneumatic balloon tires if possible.
5. The drop from the bed of the bulk trucks to the unloading chain should be as short as possible (2 to 3 inches).
6. The unloading chain of the bulk trucks should move not more than 70 feet per minute.

B. Management of Pilers.

One operation that inflicts costly damage to potatoes is that of unloading from the truck into the storage bin. This is one of the easiest points at which the operator can correct poor handling methods and stop injury. These steps should be followed to eliminate the greater portion of unloading damage.

1. Slow the piler-chain speed to 50 feet per minute.
2. Put rubber tubing over each link.
3. Pad the hopper with sheet sponge-rubber.
4. Feed the potatoes into the hopper steadily.
5. Handle the sacked potatoes with care. Empty the sacks gently.
6. Keep the delivery end of the elevator a short distance above the pile. Do not allow the potatoes to pile up and drag back down the piler chain.