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Harvesting Field Peas With the Combine

BY
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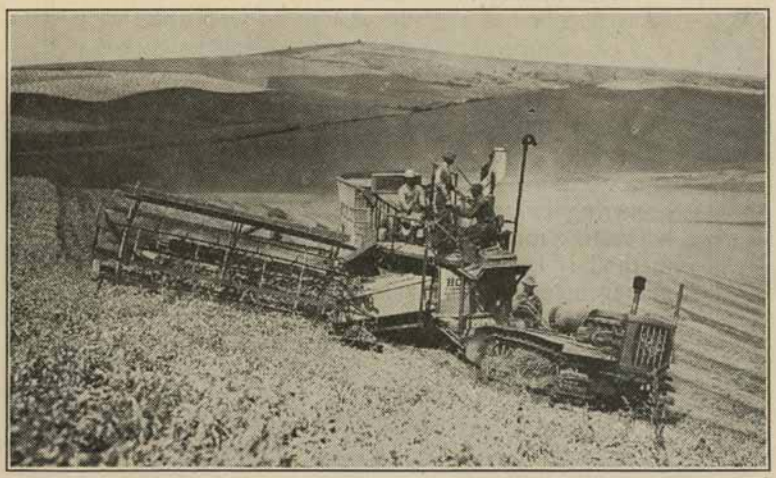

COOPERATIVE EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS OF THE STATE OF IDAHO, UNIVERSITY OF IDAHO COLLEGE OF AGRICULTURE AND UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

AGRICULTURAL ENGINEERING SECTION

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THE management and skill of the combine operator has a great deal to do with the success or failure of the attachments developed for the direct combining of field peas. Weather conditions and field topography are factors which contribute to harvest losses and have influenced the results obtained by this study. Field observations indicate considerable shattering of peas occurring before the fields are entered with the harvesting machinery and that the success of any method is largely dependent upon the skill and management of the machine operator.

Harvesting Field Peas with the Combine

By

*Hobart Beresford and E. N. Humphrey

THE direct harvesting of field peas with the combine has been found by many farmers to be a means of reducing costs and of saving a higher percentage of the crop. In 1929 Idaho had 54,868 acres of field peas grown alone and 1,552 acres grown with other crops with a total yield of 1,094,430 bushels.† Approximately one-third of this acreage was grown in the dry-farming regions, where the pea and wheat rotation is replacing the summer-fallow practice of farming. Field studies of the loss of peas due to harvest methods have shown that the old system of mowing, raking, and bunching the vines, which were later loaded on the wagons and hauled to the stationary thresher, produced heavy losses. When the peas were over-

Fig. 1—The result of excessive handling and over-ripe vines.

ripe the frequent handling of the vines caused a maximum loss of one-half the expected yield. Area counts made in pea fields harvested by the above method showed seven and one-half bushels per acre loss where the total yield should have been fifteen bushels. Similar counts on comparable areas in a field harvested with a combine showed a total loss of only two and one-half bushels per acre. During the harvest period, winds often cause much shattering by rolling the bunched vines about the field.

Earlier harvesting, if practiced generally, would greatly reduce the number of pea weevil adults which escaped each fall. It is known, in the Palouse area, that adults which escape in the fall hibernate and

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†United States Census 1930 Preliminary Report.

infest peas the following year. It seems likely that the number of escaping weevils could be greatly reduced by earlier harvesting, which would permit correspondingly earlier fumigation of peas to kill weevils in them. Early harvesting would also allow earlier fall tillage which would reduce the numbers of weevils escaping from shattered peas.*

The Use of the Combine

The first use of the combine in the pea fields was as a semi-stationary threshing outfit. The peas were pitched onto the header platform and threshed while the machine was standing between moves or as it moved slowly through the field. This practice necessitated removal of the reel and required that the guards be covered by a wide board in order to prevent the vines from tangling as they were pitched onto the platform.

Fig. 2—The semi-stationary use of the combine reduces labor and minimizes loss of peas by shattering.

Four to six men were required for feeding the machine while two or three were needed for handling the combine and tractor or teams. The cost of threshing peas by this method was $0.3423 per bushel as compared with $0.5303 per bushel for threshing out of the shock with the stationary machine.

Windrow Pick-Ups

Following the use of the semi-stationary combine method, windrow pick-ups were developed by the implement manufacturers. A mower equipped with vine lifters or pea guards was used for cutting the vines which were windrowed with a side-delivery rake and threshed with a combine and windrow pick-up.

*Based on data obtained from Claude Wakeland, Head, Department of Entomology.

COMBINING COSTS*

Harvesting Costs for Combining with Tractors

COSTS PER ACRE

Operator No.	Season	Days Combining	ACRES Per Day	ACRES Total	BUSHELS Per Acre	BUSHELS Total	FIXED CHARGE Tractor	FIXED CHARGE Combine	FIXED CHARGE Total	OPERATION CHARGE Tractor	OPERATION CHARGE Combine	OPERATION CHARGE Total	TOTAL CHARGE Tractor	TOTAL CHARGE Combine	TOTAL CHARGE Total
4	1929	21.5	16.23	349	15.46	5398.3	$.4263	$1.0745	$1.5008	$ .7387	$1.8357	$2.5744	$1.1650	$2.9102	$4.0752
8	1929	10	20	200	15.56	3112	.2960	.999	1.295	.6332	1.2809	1.9141	.9292	2.2799	3.2091
Wt. Avg.			17.42		15.501		.3788	1.0471	1.4259	.7002	1.6335	2.3337	1.0790	2.6806	3.7596

COSTS PER BUSHEL

Operator No.	Season	Days Combining	ACRES Per Day	ACRES Total	BUSHELS Per Acre	BUSHELS Total	FIXED CHARGE Tractor	FIXED CHARGE Combine	FIXED CHARGE Total	OPERATION CHARGE Tractor	OPERATION CHARGE Combine	OPERATION CHARGE Total	TOTAL CHARGE Tractor	TOTAL CHARGE Combine	TOTAL CHARGE Total
4	1929	21.5	16.23	349	15.46	5398.3	$.02754	$.07344	$.10098	$.04778	$.11873	$.16651	$.07532	$.19217	$.26749
8	1929	10	20	200	15.56	3112	.01902	.06796	.08698	.04069	.08232	.12301	.05971	.15028	.20999
Wt. Avg.			17.42		15.501		.02442	.07143	.09585	.04519	.10542	.15061	.06961	.17685	.24646

*Cost data furnished by the Department of Agricultural Engineering, Agricultural Experiment Station.

Loss of peas due to shattering and the labor costs due to excessive handling suggested the direct combining of field peas which has been in practice the last few years.

Direct Combining

The development of several new devices for adapting the combine to direct harvesting has increased the interest in this method, and the improvement in equipment has aided in producing greater efficiency. A study of several of the combines used for the direct harvesting of field peas was made in 1931 and shows that in addition to the customary adjustments, such as the slower cylinder speed and the removal of the concaves necessary for the successful threshing of peas, usually three major changes are made on the combine: first, the position of the cutter bar and guards is altered by moving the bar forward and tilting or lowering it to the ground; second, nearly every machine requires a greater range of manipulation for the header platform, which is obtained by individual controls at each end of the platform; third, the reels are redesigned by moving them forward or by lowering to meet the new position of the cutter bar. The vine lifters or pea guards developed for the combine are either exact duplicates or patterned after the guards developed for mowing machines.

Studies of the cost of harvesting peas by the direct-combine method were made on two of these outfits during the 1929 season. A total of 549 acres of peas yielding 8,510.3 bushels were harvested in 31.5 machine days. The cost of harvesting by this method averaged $3.7596 per acre or $0.24646 per bushel and does not include the cost of the sacks. Peas which yielded 15.5 bushels per acre were harvested at the rate of 17.42 acres per day.

Advance-Rumely Attachment

On this attachment the cutter bar is dropped and moved forward by a special metal bar mounting which also carries the guards. In addition to changing the position of the cutter bar the header is operated close to the ground by means of three metal shoes attached to the platform for the purpose of regulating and limiting its adjustment. A standard binder sickle and guards are used on this cutter bar and a rolling coulter is mounted on the end for the purpose of cutting the vines and leaving a clean swath. The tension on the three header bar springs is tightened to compensate for the lowered position of the header. The regular combine six-blade reel is moved forward and lowered so that it comes in contact with the vines and at the same time clears the edge of the platform.

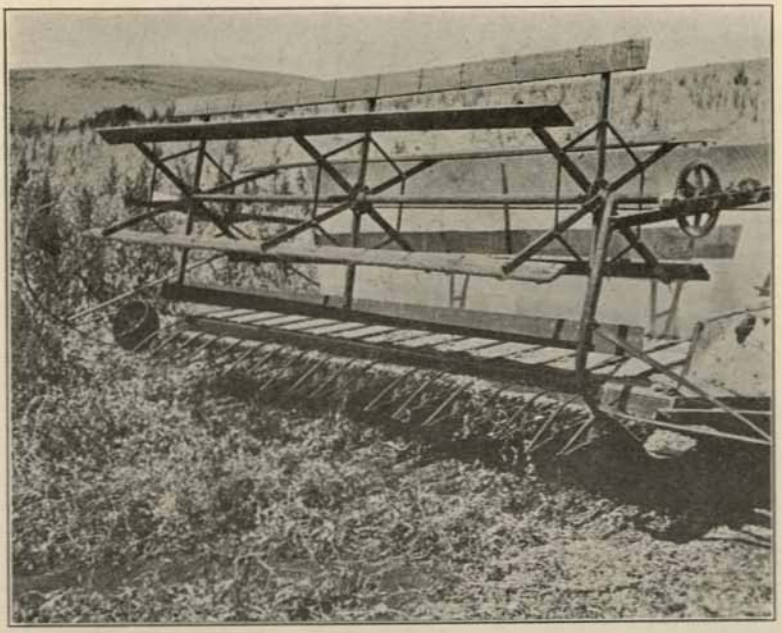


Fig. 3—The rolling coulter mounted at the end of the cutter bar aids in leaving a clean swath

EQUIPMENT REQUIRED

ITEM	MANUFACTURED BY	ADDRESS	COST
Cutter bar and mounting Sickle guards and coulter	Advance-Rumely Company	1029 Railroad Ave. Spokane, Wash.	Total $125.00

HARVEST RECORD

SEASON	Number of Acres Harvested	Harvested Yield per Acre	Loss per Acre During Harvest
1931	170	1,446 lbs.	132 lbs.

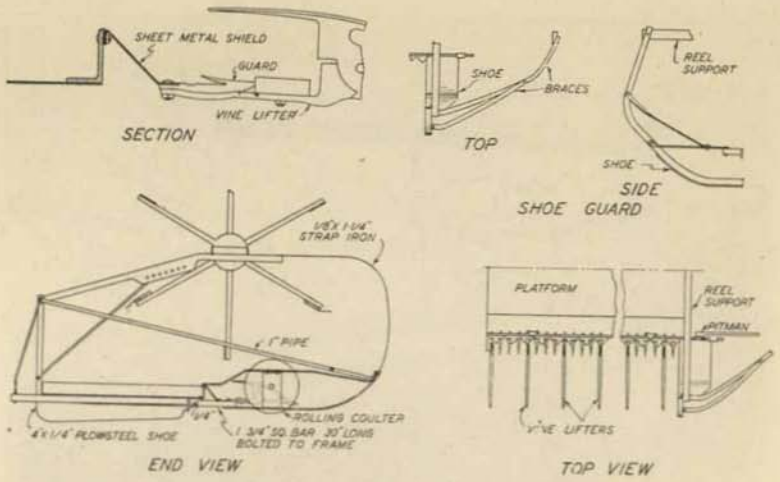


Fig. 4—Details of the Advance-Rumely attachment.

Gano Cutter Bar and Vine Lifter

On this machine the combine cutter bar is replaced with a mower cutter bar to the ends of which are mounted metal shoes. This bar is carried next to the ground and about three feet in advance of the header platform by means of a tubular frame which extends under the platform and attaches directly to the balancing mechanism to which is added an additional beam and weights. The pitman is driven by an extension of the shaft fitted with two universal joints. A narrow sheet metal apron is mounted on the front edge of the header platform and the space between the cutter bar and platform

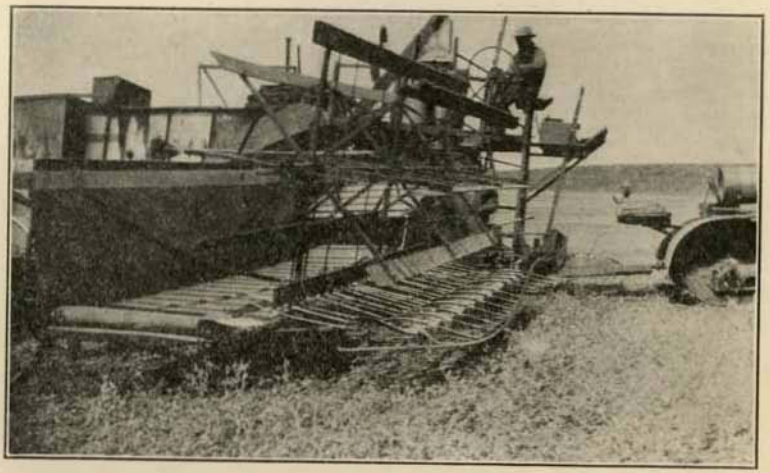


Fig. 5—The metal rack between cutter bar and header platform prevents small stones from reaching the cylinder.

is spanned by a flexible metal rack made of strap steel. A mower-type sickle and guards with especially long vine lifters are used on the bar. The regular combine grain reel is lowered and set forward to operate directly over the flexible metal rack. This attachment has been used successfully for three seasons.

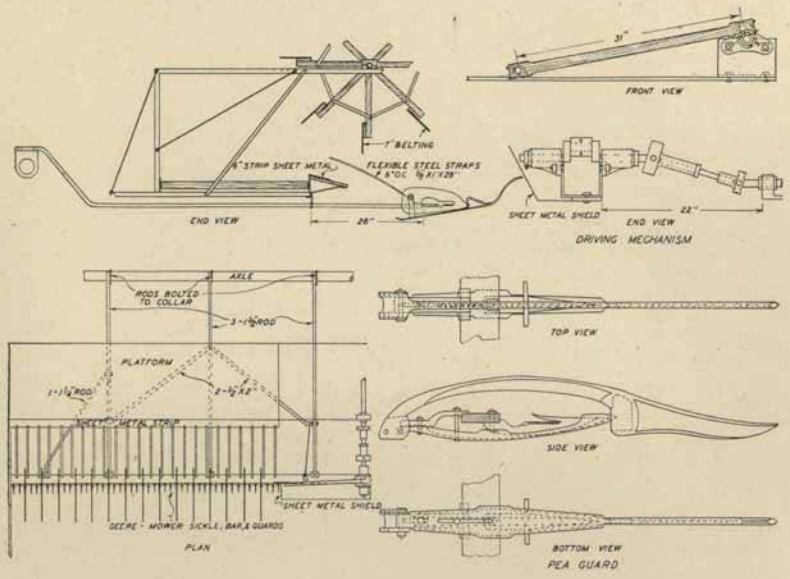


Fig. 6—Detail of the Gano cutter bar and vine lifter attachment.

EQUIPMENT REQUIRED

Item	Manufactured by	Address	Cost
Mounting	*Farm made		
	Developed by	Moscow, Idaho	
Mower sickle and bar	Ward Gano Deere & Company	Moline, Illinois	Total $200.00
Guards	F. Blacki	Sheboygan, Wis.	

HARVEST RECORD

Season	Number of Acres Harvested	Harvested Yield per Acre	Loss per Acre During Harvest
1931	96	1,037 lbs.	480 lbs.

*1931 operator, Arthur Snow, Moscow, Idaho.

Hagedorn Brothers Cutter Bar

This cutter bar replaces the regular combine cutter bar and is bolted on to the header platform by means of an angle-iron mounting. The mounting lowers the position of the cutter bar and allows the platform to tilt through the same range of adjustment as the regular header.

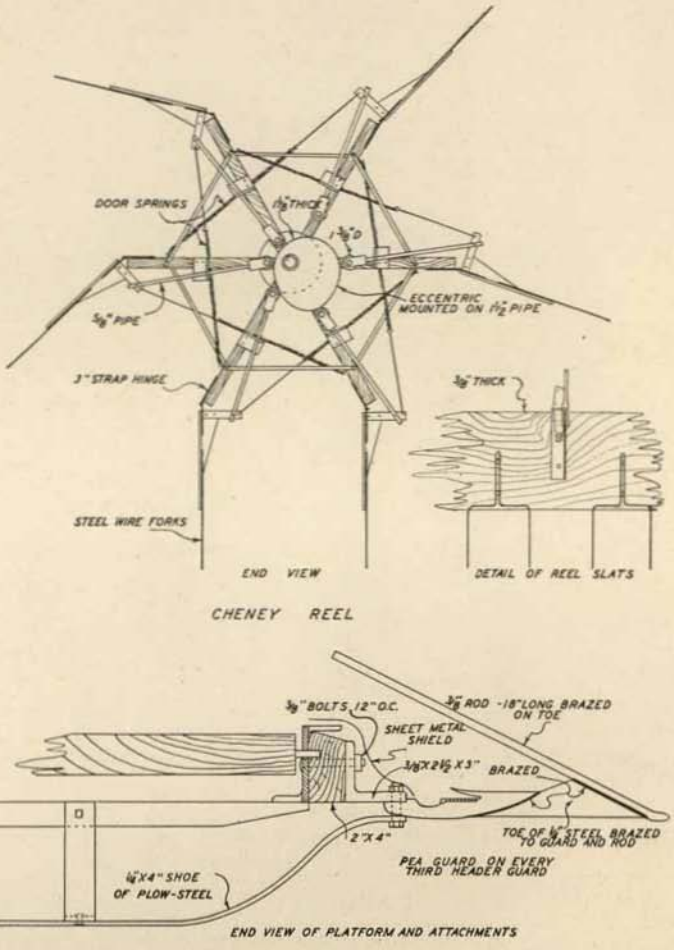


Fig. 7—Detail of the Hagedorn Brothers cutter bar and the Cheney "grain-saver" reel.

A standard mower sickle and guards with vine lifters are mounted on a two and one-half by three-inch, three-eighths-inch heavy angle-iron bar on the end of which is mounted a metal shoe that allows the guards to comb the surface of the ground without digging.

The range of adjustment for the outer end of the header platform is increased by adding a lever to the regular raising and lowering device.

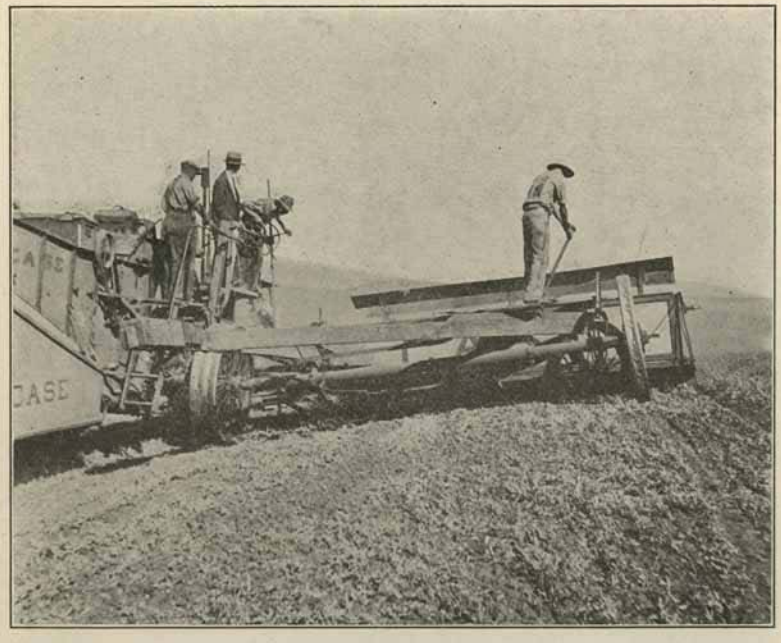
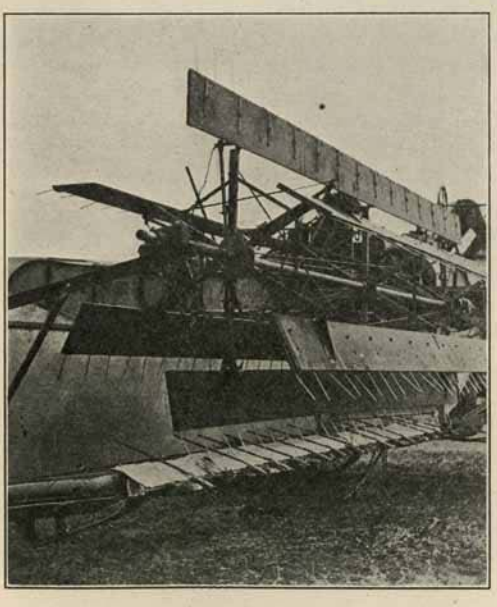


Fig. 8--A close adjustment of the header platform is required for pea harvesting.



The patented Cheney "grain-saver" reel is used on this outfit. This reel operates on an eccentric which causes the reel blades to withdraw their tines from the vines thus reducing the shattering which might occur from the use of the ordinary type of reel.

Fig. 9—Showing flexible guards and apron on the Hagedorn Brothers cutter bar.

EQUIPMENT REQUIRED

Item	Manufactured by	Address	Cost
Cutter bar and mounting	Hagedorn Brothers	Moscow, Idaho	
Guards and vine lifters	Hagedorn Brothers	Moscow, Idaho	
Cheney reel	Cheney Rod and Weeder Company	Cheney, Wash.	Total $193.25

HARVEST RECORD

Season	Number of Acres Harvested	Harvested Yield per Acre	Loss per Acre During Harvest
1931	135	1,394.55 lbs.	408 lbs.

Hume-Love Cutter Bar

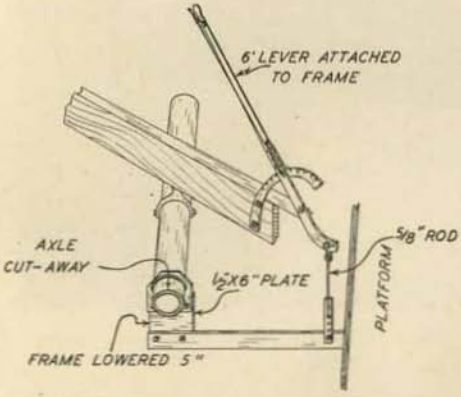


Fig. 10—Detail of the platform leveling device.

This cutter bar is substituted for the one furnished by the combine manufacturer and is placed about eight inches ahead and four inches lower; thus allowing the header platform to meet field adjustments without increased tilting. A flexible coupling mounted on the header platform carries the cutter bar assembly. The space between the cutter bar and the platform is bridged by a flexible metal apron made of 18-gauge galvanized iron. This apron which is shielded by one-eighth by three-sixteenths-inch steel bars prevents the loss of pea pods between the cutter bar and platform. A standard grain binder sickle and guards are used on this cutter bar to which has been added, by the operator, the patented flexible vine lifters. The reel used is a regular eight-blade combine reel with alternate blades removed.

EQUIPMENT REQUIRED

Item	Manufactured by	Address	Cost
Cutter bar and mounting	Hume-Love	Garfield, Wash.	
Vine lifters	Superior Company	Manitowac, Wis.	Total $150.00

HARVEST RECORD

Season	Number of Acres Harvested	Harvested Yield per Acre	Loss per Acre During Harvest
1931	267	690 lbs.	671.5 lbs.

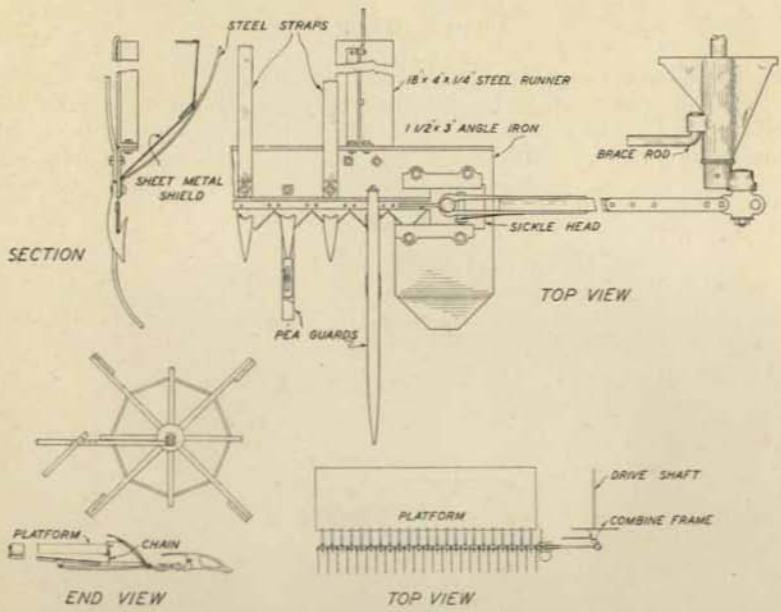


Fig. 11—Detail of the Hume-Love cutter bar and mounting.

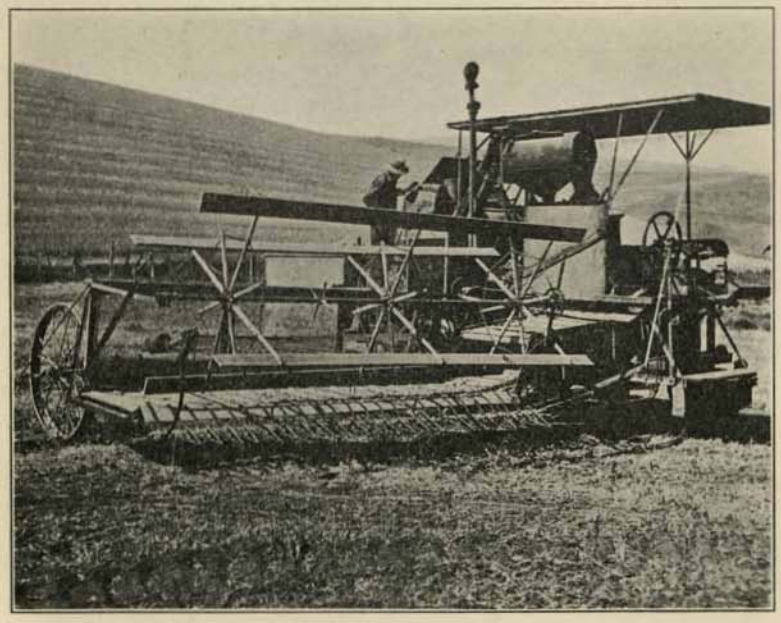


Fig. 12—For combining peas alternate slats are removed from the standard reel.

Tate Cutter Bar

The original combine cutter bar is replaced by the special bar which is mounted on the header platform similarly to the regular bar except that a thick wooden plate made by beveling a 2 x 4-inch timber is mounted between the bar and the platform. The bar is

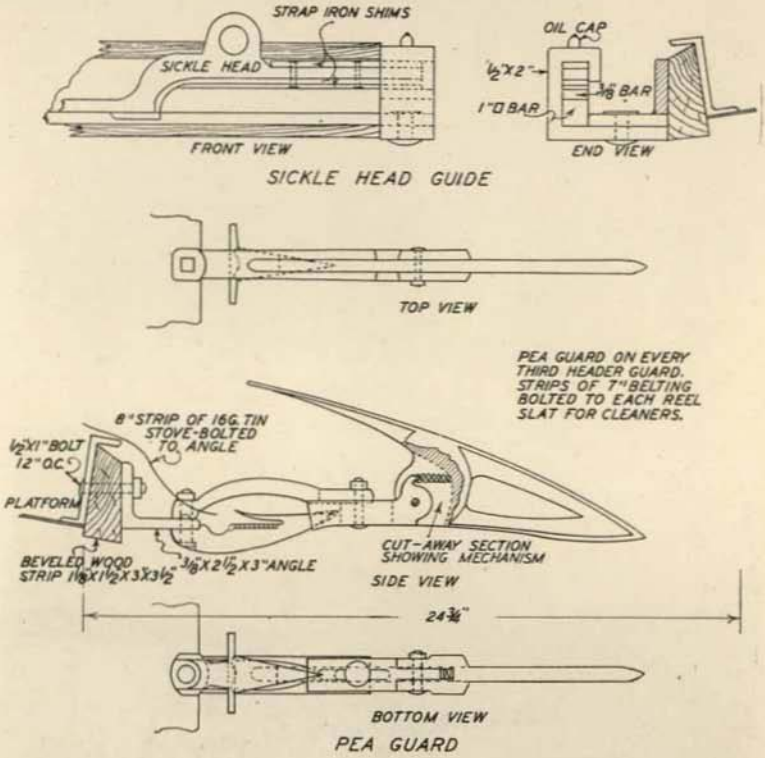


Fig. 13—Detail of the Tate cutter bar and mounting.

also lowered by the angle-iron mounting. The beveled plate causes the guards to set at an angle so that when the header is tilted toward the ground the guards are parallel with the ground thus securing the same range of elevation as the regular combine. Patented vine lifters also may be attached to this bar which uses a mower sickle and guards attached to a heavy 2½ x 3-inch angle iron. The pitman has a dowel joint strapped with two ⅜-inch iron rods to allow for the angularity caused by the beveled plate changing the position of the cutter bar. A standard grain reel is set slightly forward and lowered so as to push the vines onto the platform.

A large lever is mounted between the outer balance beam and header for the purpose of the independent control of the adjustment of each end of the header platform. When the header is lowered to the ground it is necessary to have the control of each end within much

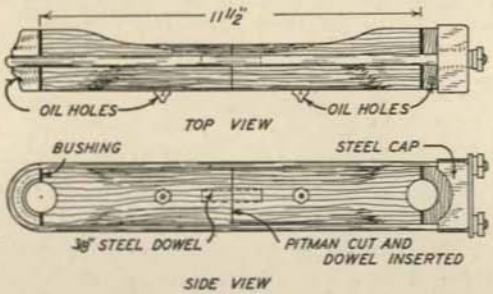


Fig. 14—Flexible pitman showing dowel joint.

closer limits than when heading grain, otherwise the outer end has a tendency to give considerable trouble by plowing. No provision is made for the removal of the sickle without dismantling as the sickle will cover considerable acreage without sharpening and usually will last the entire season.

EQUIPMENT REQUIRED

Item	Manufactured by	Address	Cost
Cutter bar and mounting	W. P. Tate	Pullman, Wash.	$180.00

HARVEST RECORD

Season	Number of Acres Harvested	Harvested Yield per Acre	Loss per Acre During Harvest
1931	530	1,080 lbs.	502 lbs.

Summary of Field Operations

Counts of shattered peas were made in the fields to ascertain the loss for the semi-stationary-combine method of harvesting as compared with the stationary harvesting where the peas are mowed, raked, and bunched. By the semi-stationary-combine method an average harvested yield of 1,350 pounds per acre was obtained in a 46-acre field of peas with a loss of 333 pounds per acre. In the 55-acre field which was harvested by the stationary-thresher method, 1,104 pounds of harvested peas were obtained per acre. The field counts showed a loss of 895 pounds per acre.

Summary of Pea Combining

Name of Attachment	Cost of Equipment	Number of Acres Harvested	Harvested Yield per Acre	Loss per Acre During Harvest
Advance-Rumely	$125.00	170 Acres	1,446 Lbs.	132 Lbs.
Gano	$200.00	95	1,037	480
Hagedorn Brothers	$193.25	135	1,394.55	408
Hume-Love	$150.00	267	690	671.5
Tate	$180.00	530	1,080	502
Total		1,198 Acres		
Average per acre			1,129.51 Lbs.	438.7 Lbs.

The best record for the direct-combine method was on 170 acres which yielded 1,446 pounds per acre harvested peas with a field loss of 132 pounds per acre. The average for 1,198 acres of peas harvested by the direct-combine method gave a yield of 1,129.51 pounds of harvested peas per acre with an average harvest loss of 438.7 pounds per acre.