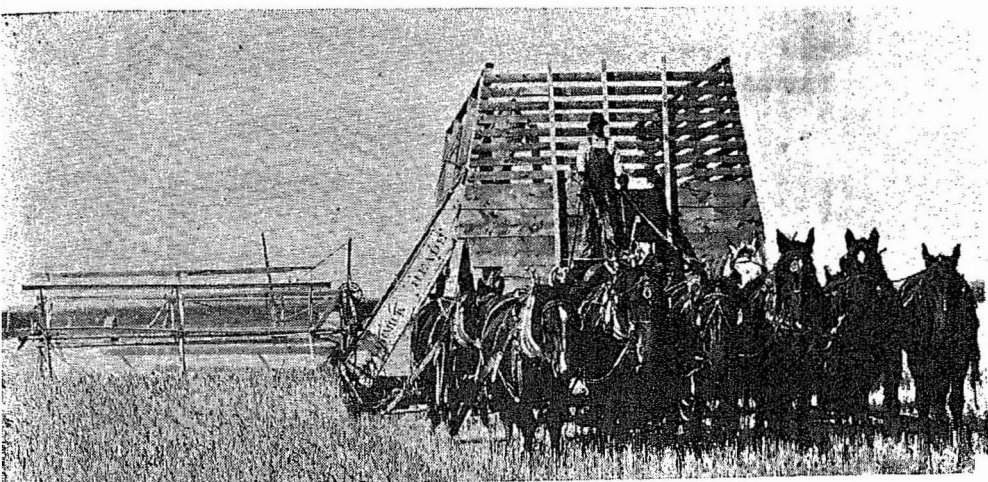


Reducing the Cost of Montana's Dry Land Wheat Harvest

By
M. L. Wilson
and
H. E. Murdock



Montana Extension Service in Agriculture
and Home Economics

F. S. COOLEY, Director

Montana State College and the United States Department of
Agriculture Cooperating.

Acts of Congress, May 8 and June 30, 1914.

This page blank in the original.

Reducing Wheat Harvesting Costs on Montana Dry Lands

By

M. L. WILSON, Farm Economics Specialist

H. E. MURDOCK, Professor of Agricultural Engineering

INTRODUCTION

Customs and habits govern farming as they do other modes of life. The farmer simply starts farming in a new agricultural area with the farming system he learned in the country from which he came. Where he finds that old ideas and methods fail to bring success in the new country, he slowly but surely turns to new ideas and devices which seem more adapted to his new location. The working over and testing out of these many new ideas by the farmers in any new agricultural community gradually bring about a new type of farming, which in turn becomes the custom and habit of the younger generation of farmers of that region.

Montana is, comparatively speaking, a new agricultural region, especially in the dry land wheat sections. Most of Montana's dry land wheat farms have been settled since 1907, the bulk of settlement taking place between 1909 and 1912. The present generation of Montana farmers is, then, largely a generation of farmers trained in the farming methods of older and more humid states, and without previous dry farming experience. Montana's dry land farmers now are working out the new type of agriculture that will eventually be practiced here, and they are working out their farming problem in the midst of severe general economic conditions and varying local difficulties. (Note 1)

Production Cost Is Important

Five successive years of drouth, from 1917 to 1921, were

Note 1—A detailed discussion of the problem of farmers in the dry land regions of north central Montana will be found in the Montana State College Extension Service bulletin No. 66, "Dry Farming in the North Central Montana Triangle."

followed by the past years of falling wheat prices. The five years of drouth almost entirely destroyed farm reserves of feed and capital and the past two years have made recuperation difficult and slow. Thus the Montana dry land farmer, on an average, is faced by conditions that seem discouraging at the outset. On lands of medium yield and in face of a national overproduction of wheat, he still must meet wheat growing competition if he is to remain in the wheat farming business. The competitive wheat struggle for him resolves itself into a race of lowering production costs. Naturally the farmer with the highest production costs on these lands of medium yield would be the first to fail and quit farming; in the same sense the farmer with lowest production costs will more easily meet competition and remain at the farming business in Montana longest. Many believe that the present commodity price level is unfair to the farmer and should be adjusted, but in the meantime the commodity price level is a fact which must be met by lower production costs until the hoped-for adjustment takes place.

There is one fact, however, that appears to the advantage of the Montana dry land farmer. The Montana dry land wheat has a high gluten content which brings a good premium on the markets and works to his price advantage.

Montana dry farm lands are cheap priced lands so that the farmer can afford to handle larger land units without too much money tied up in farm capital. By the use of large teams and tractor outfits, through summer fallowing and by careful diversification, he is able to produce some crop every year, and at a low cost.

This bulletin is based upon the assumption that the farmer has practiced the use of large power outfits and summer fallow to multiply the value of his labor in seeding and tillage, and to more nearly assure a crop each year. (Note 2) It takes up ideas and devices that northwest dry land farmers have used to lower

Note 2—A bulletin on the use of large teams in Montana is now in process of printing and will be distributed soon after the publication of this bulletin. This new bulletin will contain detailed information about size of horse outfits, hitches, equalizers and other subjects of interest to the farmer who is interested in increasing the value of his labor by use of larger teams.

costs in harvesting the crop so produced, thus offering additional information on the general subject of cutting production costs of Montana dry land wheat.

A Summary of Actual Experiences

This bulletin is not presented as a harvesting text book, for there are few if any recommendations of a direct nature. Rather it is an offering to the Montana dry land farmer of the various systems that some farmers have used in solving the problem of harvesting costs. If in it there is found some idea or group of ideas which will apply to the farm of the reader and which will serve as the foundation for some system which will solve the reader's individual problem, it will have served the purpose of its publication.

New inventions and ideas are continually flowing into the farming business, much of this inventive action coming direct from the farmer on the land. Probably only a small fraction of these ideas are practical and worthy of adoption, yet it is this practical fraction that furnishes agriculture with the mechanical means whereby to change from old to new systems and to solve the problems of individual regions. It is noted that low crop prices and general economic depression generally serve to stimulate interest in home made labor saving appliances, a fact that has been noted often in the dry land regions of Montana in recent years.

It is confidently believed and sincerely hoped that the ideas presented in this bulletin will urge additional attention on Montana's dry land farms toward the reduction of wheat production costs, so that this dry land region may continue to be successful wheat growing country. (Note 3)

The Judith Basin and other favorable dry land wheat growing sections of the state which are affected by the mountains, have higher acre yields than the lands primarily considered in this bulletin, yet it is believed that many of the ideas presented

Note 3—Prof. Currier, head of the farm management department of the Montana Experiment Station, has given many suggestions and much help toward the publication of the text of this bulletin, and thanks of the author are due to him for that contribution.

here will be of value in reduction of harvesting costs in all of these areas.

Concerning "Labor per Acre"

Many Montana dry land farmers were brought up in the regions where the small grain acreage may not exceed 50 acres per farm, where the wheat yields from 25 to 50 bushels per acre, where straw is needed in the system of farm economy and where the small grain harvesting labor is simply shifted from corn cultivation. Under such conditions two men, one driving the binder and the other shocking, could economically harvest the grain grown on the average farm. They also could stack it and prevent damage from weather. These methods, however, do not fit Montana lands, as they involve too much labor per acre.

It takes about the same amount of man labor and about as much horse labor to cut wheat with a binder in fields yielding 30 bushels per acre as it does in fields yielding only 10 bushels per acre. There should be a relation between yields per acre and cost of harvest per acre. Practices adapted to high yielding land do not always apply to low yielding land. Inventive Montana farmers are concerned with the problem of changing their methods until low yielding wheat can be harvested economically, just as they have devised means of seeding and tillage at low acre costs. Systems are developed whereby one man (Note 4) can multiply his man power in handling a greater number of acres per hour of man labor. He is concerned more with raising the greatest number of bushels per man than bushels per acre.

Montana Harvesting and Threshing Weather

Montana harvesting and threshing weather is normally without rainfall and with dry air predominating. If each fall were certain to be dry, the problem of harvest would be much simpler than it is, for while the dry fall is typical in Montana there are occasional seasons that complicate the harvesting and threshing operations and make a rather difficult problem for the farmer.

The Pacific coast regions have developed very low cost

Note 4—This refers to the use of larger power outfits. For larger horse outfits the reader may write for the hitch bulletin referred to in Note 2. Concerning gas tractor outfits he should write for the Experiment Station bulletin No. 151, "The Gas Tractor in Montana," by H. E. Selby.

YE	JULY			AUGUST			SEPTEMBER			BAD
AR										DAYS
1881										14
83										8
84										43
85										12
86										9
87										16
88										19
89										11
1893										23
91										10
92										11
93										9
94										11
95										10
96										13
97										17
98										12
99										14
1900										17
01										12
02										3
03										17
04										2
05										3
06										7
07										7
08										8
09										9
1910										3
11										26
12										8
13										4
14										8
15										13
16										11
17										7
18										10
19										4
20										5
21										10
22										9
23										10

Figure 1—This chart is made from records of the government weather office at Havre, Montana. The vertical lines represent periods of ten days each. Black shaded portions show the days when the weather was too damp to harvest or thresh. Unshaded portions show clear harvesting weather.

methods under dependable dry weather during the harvesting season. On the other hand, the Red River Valley and other regions to the east have more unstable weather. Figure 1 shows the character of the harvesting season at Havre, Montana, where long weather records have been kept, and which is weather typical of the other dry land sections of Montana. By a study of this chart some idea may be formed as to the average weather to be expected during the harvest season over a long period of years. The chart will also prove that the best type of harvesting method may vary with the type of season.

Binder Methods

It has long been the accepted custom to harvest the grain in Montana by binders. Prior to 1917, which was the beginning of a period of dry years, it is probable that 90 per cent of our dry land grain was cut by binders. Binders are well adapted in Montana to high yielding irrigated land where tall straw is produced

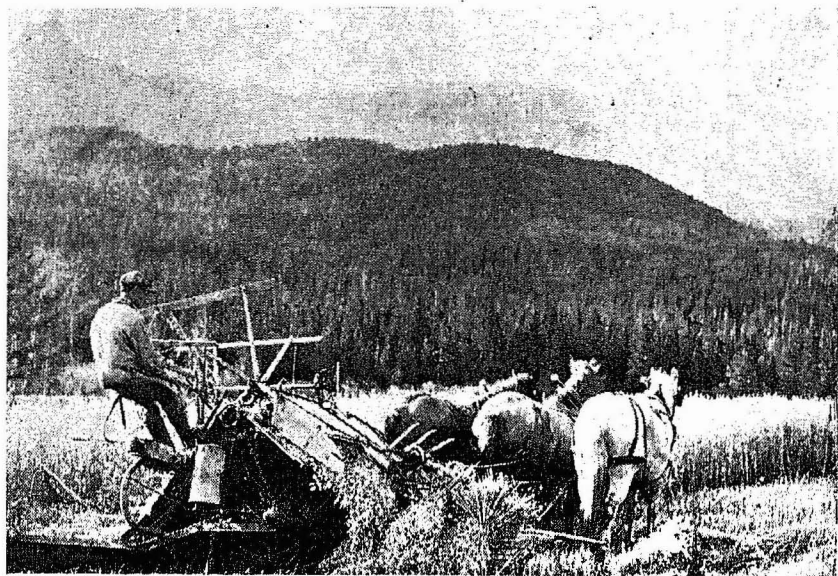


Figure 2—Binders are efficient in the smaller fields and irrigated farms of the intermountain country.

and where ripening is often uneven. (Note 5). They are adapted to small intermountain farms where fields are usually small. But there is some question as to the efficiency of binders on dry lands where the yield is below 15 bushels to the acre and where there are more than 100 acres to be cut to the farm. Here are some of the advantages and disadvantage of the binder:

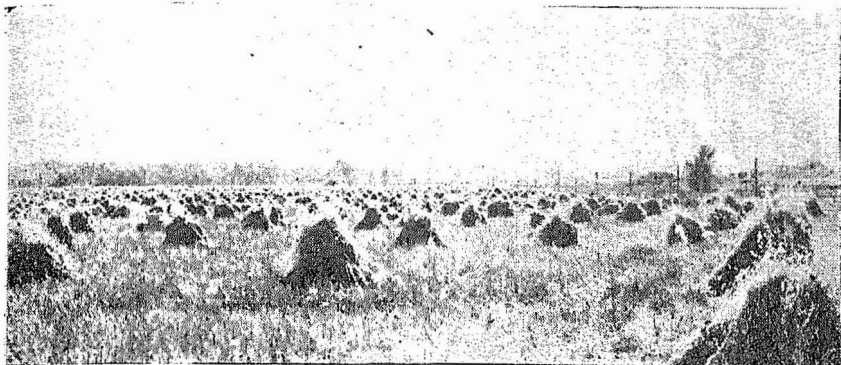


Figure 3—Intermountain fields usually yield heavily and are adapted to binder methods.

Advantages

- 1—Grain which ripens unevenly may be cut and cured without damage.
- 2—Can be used for cutting grain on the green side, therefore lengthening the grain cutting season.
- 3—Can cut wheat, rye and oat hay on the green side for horse hay and green feed.
- 4—Adapted to a year when the grain is slow in ripening.
- 5—Will cut wheat or grain infested with the Russian thistle.

Disadvantages

- 1—It is difficult to bind short grain in dry years.
- 2—Requires much hand labor in shocking and hauling bundles to the machine.
- 3—Too much labor requirement for low yielding grain fields.

Note 5—From the time of dry land settlement until 1917 much of the wheat on the Montana dry lands was high yielding because of favorable weather and soil conditions and the binder was more efficiently used in this heavier grain.

Where the farmer has a large acreage to cut he must have binders that are dependable. He will find it more profitable to discard binders as soon as they grow old enough to become undependable. It is generally estimated that 2,000 acres is the life of an ordinary binder under Montana conditions.

Sometimes during the press of harvest farmers wish to continue grain cutting at night. This can be done by tying a lantern to the single-tree of the horse walking next to the grain. This gives sufficient light to keep the binder in its proper position.

Satisfactory tractor-binder hitches have been developed to make binders more efficient on large fields.

Push Binders

Combination push binders and headers are growing in popularity. They are constructed so that either a binder or a header-elevator may be used on the same platform, and allowing them to be used as a header in connection with the header-barges described later in this bulletin. A farmer having such an outfit may use a binder head in a "binder year" and the header during a "header year." Twenty-five acres per day may be cut with a 12-foot machine in medium grain. It requires two men to keep up in shocking medium grain.

Shocking varies, of course, according to the straw and the yield of grain. Experience indicates that the 14-foot cut is a little too wide for the binder head, as in heavy grain the bundles

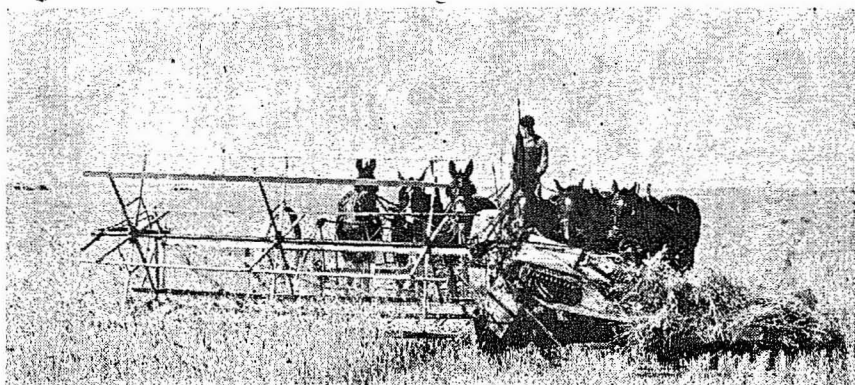


Figure 4—The push-binder is common in Montana. The combination push-binder and header is growing in popularity each year.

come out faster than the binder can bind them. Some farmers, because of labor shortage, have eliminated shocking, allowing the bundles to remain on the ground, but this is doubtful practice since there is danger from damage by weather and because additional time and labor are required to gather them up during the threshing season. But little can be said in connection with shocking as far as labor saving devices are concerned.

In using the binder there is an advantage in that the binder may be started on the green side and the header used later when the grain is further ripened.

Headers

The use of headers is increasing on Montana dry land farms where there are 100 acres or more of grain to cut each year. They are well adapted to short grain which has ripened evenly. Headers began to be common on Montana dry farms in the period of light crops starting with 1917. The header proved valuable during this period and many farmers who came from the binder country changed to headers. Wages also had an effect on the change for in 1913 shockers could be employed for as little as \$2.00 to \$2.50 per day where they now command about \$4.00. Also in the season from 1910 to 1916 the grain ranged fairly tall and

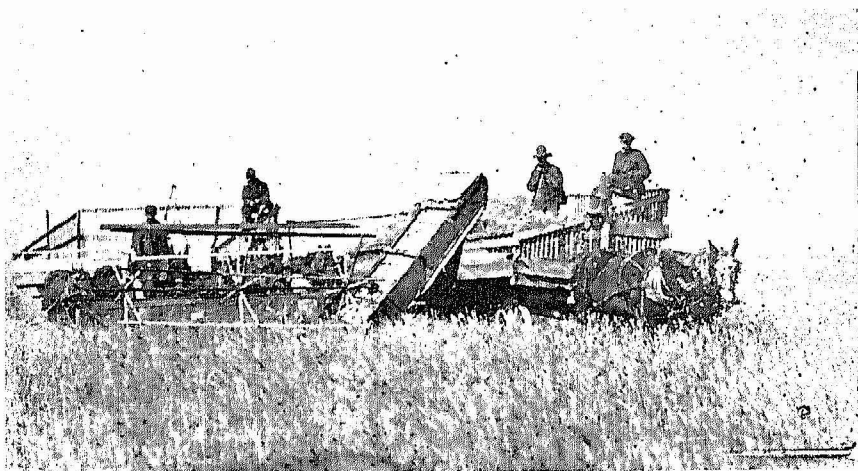


Figure 5—Headers are well adapted to short grain which has ripened evenly.

was much more adapted to binder work than it was from 1917 to 1922. Under many conditions heading is undoubtedly cheaper than cutting with binders.

Advantages

- 1—Cut and stacked in one operation.
- 2—Is efficient in dry years.
- 3—A crew can cut 500 acres in one season.
- 4—A header may be used as a push binder in seasons adapted to heading.
- 5—Especially adapted to short straw which cannot be easily bound in dry years.

Disadvantages

- 1—Does not get as much straw.
- 2—Stack damage may result from unevenly ripened grain.
- 3—Green Russian thistle tips may cause mold in the stack.
- 4—Takes a large crew when farmers may find difficulty in employing extra men.

Heading is a dry country practice which often looks odd to people who have been accustomed to using binders. Headers, nowever, have long been in use in the semi-arid regions.

Common Montana Methods

The common Montana heading outfit consists of a crew of six men and 10 horses, as follows: one header driver, two header-box drivers who also pitch at the stack, one header loader, one spike pitcher, one stacker, six horses on the header and four horses on two header wagons. (In heavy grain a third header-box wagon may be necessary.) This outfit, using a 14-foot header, will cut and stack about 30 acres of wheat per day in medium grain.

Laying Out Header Lands

Header operations may be made more economical by so laying out the lands that but little time is lost in changing header-box wagons and also in locating the stacks so that the loaded wagon will have but a short distance to go to unload. Too much Montana

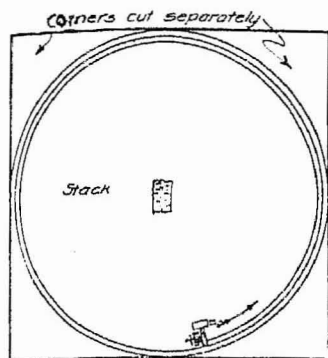


Figure 6—The circular header land system. Grain cutting begins in the center and continues in an ever widening circle.

heading is done in a haphazard way, with no plans for location of stacks or for other time and labor saving features.

A header land should be large enough that the grain from it will make enough stacks for one thresher setting. If good sized stacks are built 40 acres of medium grain usually will make a fair setting. Two systems of laying out lands are recommended:

The Circular System—With this system the header driver begins in the approximate center of a square whose area will cut sufficient grain to make a setting. The header driver starts in a circle, the circle widening until this land is all cut. In this way there is no stopping to turn corners and therefore the only stops made by the header are in changing header boxes. Small, triangular lands are left in the four corners of this square. The field, however, is generally so laid out that the triangles of four lands remain as a small irregular patch. These patches are cut after the main field has been completed, the principle object being to get the main field cut and the stack made as soon as possible, then to finish the smaller pieces after the main job is done.

Divided Strip System—The other system consists of laying out the field in a long narrow strip. The strip then is cut across the middle to divide it into two lands. Each of the two lands should be long enough so that the header will gather a load in the header box while passing down one side, across the end and up the other side, arriving at the division space with a loaded header box. The stacks are started in the division space so that the other header box, which has just been unloaded, will have but a short distance to drive from the stack to the header which has just filled another box. The main object of the cross-cut space is to place the stacks so that the wagons will have to drive but a short distance from the header to the stack and return.

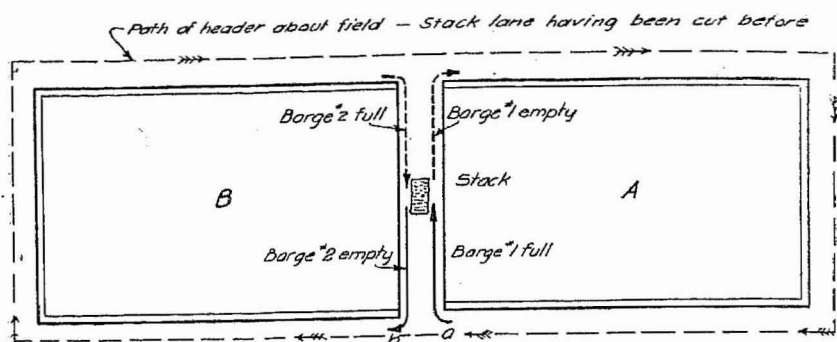


Figure 7—The divided-strip header land. As header moves to left at bottom of field barge No. 2 accompanies it. When it gets to the upper center on field B barge No. 2 is full and turns from the header toward the stack as soon as the elevator is empty. Barge No. 1, which is now empty, stands in its place ready for the header and after it has crossed the cut strip both travel off together. The header is always moving and no grain is lost while the change of boxes takes place.

Another important advantage here is that the header does not stop in changing wagons. The empty wagon waits at the beginning of its land for the header. As the header finishes loading one wagon it strikes the cross-cut space where no grain falls upon the canvas and where the elevator is emptied. The cross-cut is just wide enough so that the elevator becomes empty when the loaded wagon is close behind the empty wagon. The loaded wagon now stops and the header, which is now empty, leaves the loaded wagon team and begins cutting beside the waiting empty box, which starts traveling with the header. Thus the header wastes no grain and no stop is made between loads. With this system the header-box loader hastens from the loaded box and gets into the empty box.

If a spike pitcher is used in connection with the header box driver, making two pitchers on the stack, it is most economical to have a man on each header box who serves as a loader and also as a spike pitcher at the stack. Farmers who harvest with headers say it is important to keep the header moving all the time.

Derrick Header Stacking

A few Montana farmers are using derricks and slings to convey the headed grain from the header-box to the stack. By

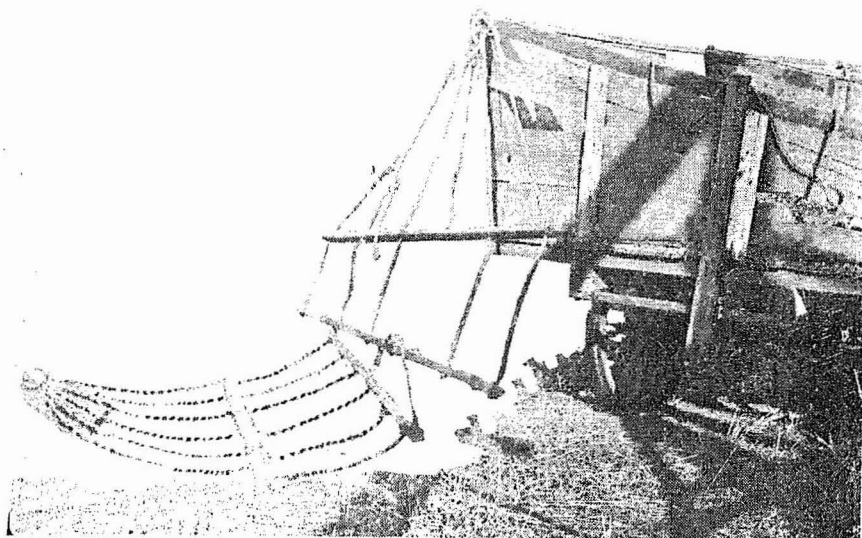


Figure 8—The header box sling should trip in the middle to drop the load on the stack in the proper manner.

this they save an extra spike pitcher at the stack, do away with considerable drudgery in handling the grain and make possible the use of family labor in place of expensive hired labor. Boys can drive the sling cable team for this outfit. Special compartment header boxes are necessary if this outfit be operated properly.

Header Boxes, Slings and Nets

The standard header box is 16 feet long and seven and one-half feet wide at the bottom, with slightly spreading sides. A partition from side to side in the center of the box divides it into two compartments. (Figure 9). A sling is used for each compartment and takes its load out smoothly and evenly. It also allows the sling to drop a load on the stack that is not too large to be distributed easily by the stacker. Slings may be purchased at any hardware or implement store or they may be made on the farm. (Figure 8). The slats usually are two-by-fours with ropes or small steel halter chains going through them. The sling net should have its trip in the center so the load may be dropped on the stack in a "flattened out" manner.

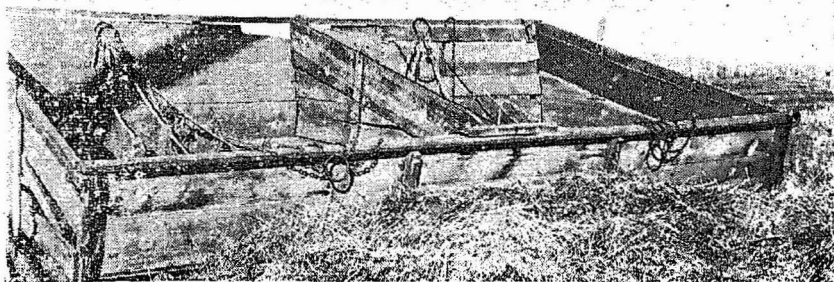


Figure 9—A close view of a header box wagon for use with slings, showing the partition.

Stackers

Ordinary hay stackers can be used, but in the west they often are mounted on truck wheels in order that the stacker may be pulled easily from setting to setting. Not much extra time is required in putting the stacker into operation.

If the grain is ripe and dry, large stacks usually are made with the stacker and slings. Often 40 or more acres of grain are placed in two large stacks, making one setting for the threshing outfit.

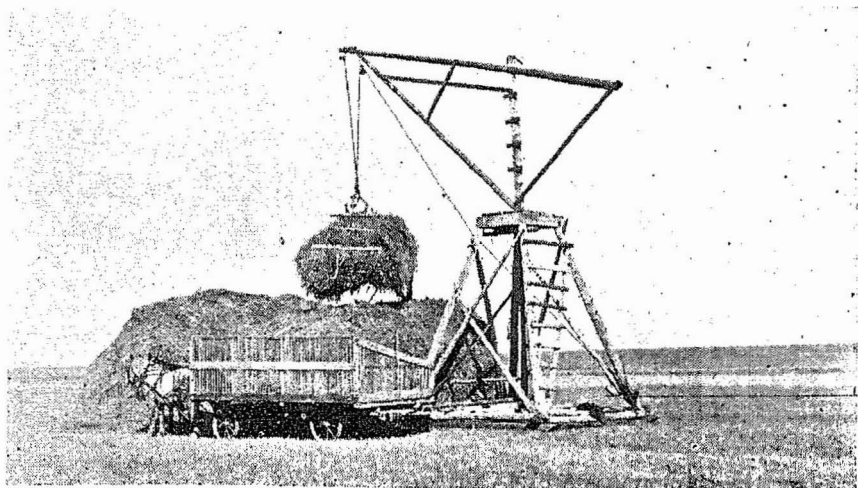


Figure 10—Hay stackers often are used with slings or nets to stack headed grain

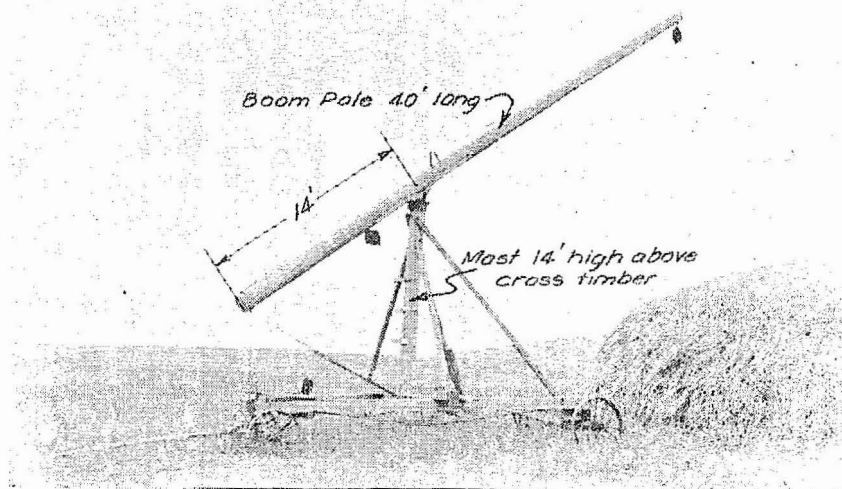


Figure 11—A commonly used stacker mounted on trucks, with some dimensions given.

Russian Thistles in Headed Grain

Russian thistles have been troublesome in wheat fields. The ball-like shape of the Russian thistle plant causes trouble in binders because the spreading branches cause the butts of the bundles to spread out in such a manner that the machine cannot properly bind it. Where headers are used, the green succulent tips of the Russian thistles are intermixed with the headed grain, which, when placed in stacks, cause mold and discoloration of the grain and greatly reduce the market grade.

The only cure is not to have Russian thistles. They can be eliminated largely through delayed seeding, with duck-footing ahead of the drill. However, we have observed no way of preventing stack mold where the green tips are numerous in headed grain. Stack mold to a certain degree can be prevented but not entirely eliminated through stack ventilators.

Header Stack Ventilators

A header stack ventilation system used throughout Idaho and the northwest is explained here for the consideration of Montana farmers. Two poles, to which cleats are nailed in ladder fashion, are set lengthwise across the bottom of the stack. The poles are

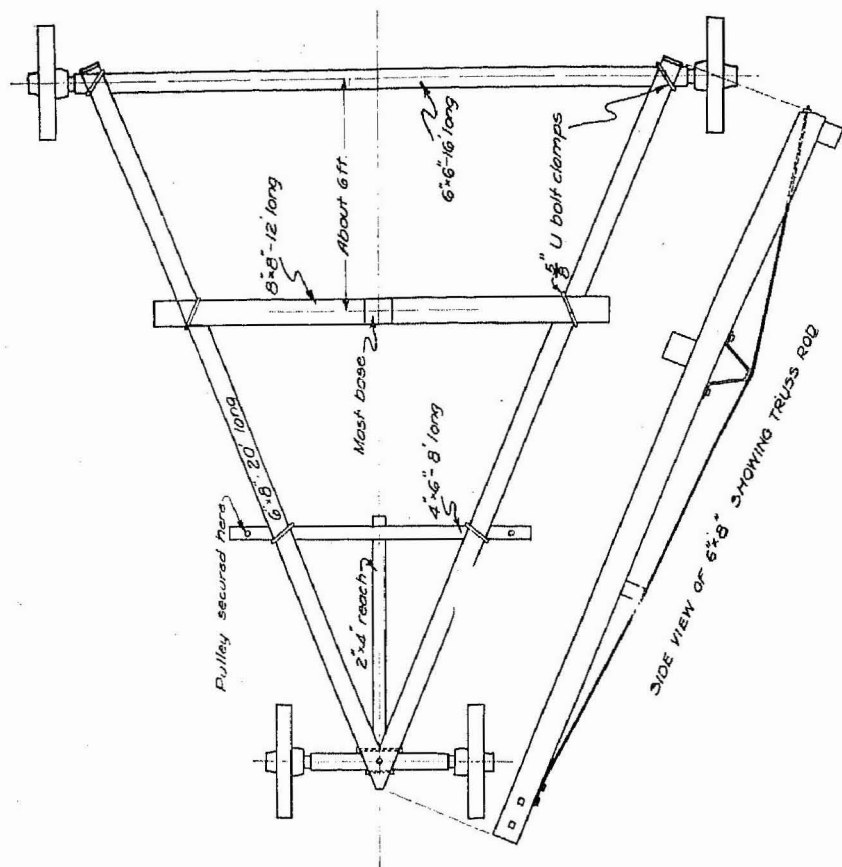


Figure 12—Detailed drawing of a good type of stacker platform mounted on truck wheels

placed on the ground, cleats up, and the stack is built over them. The cleats hold the grain away from the ground between the poles and allow air to circulate through the bottom of the stack. Burlap bags are stuffed with straw and set on the cleats, about six feet apart. A rope is tied to the top of each bag. When headed grain has been stacked around the bags to their tops, the ropes are pulled, thus raising the bags and leaving holes in the stack. If this be continued until the stack is finished there is ventilation across the bottom and through the center of the stack. The objection to these ventilator flues is that it is hard to keep rain from entering them.



Figure 13—Ventilating header stacks by means of burlap bags filled with straw and raised as the stack is built, the holes permitting circulation of air.

Field Header Threshing

When standing wheat is dry enough, it may be threshed direct from the header boxes without much addition to the crew, if the grain can be run into field granaries or otherwise taken care of quickly. Such an outfit, while it requires a much larger crew than does a combine, approaches it in efficiency more nearly than does any other method of threshing. Figure 14 shows a good type of derrick or unloading table to be used with a field header threshing outfit. It is mounted on truck wheels. Specifications for its construction are given in Figure 16.

The "double header" crew shown in the outfit illustrated consists of the following:

- Two 12 or 14-foot headers

- Four header boxes, compartment sling type

- Two header box loaders

- Three hoe-down men on the derrick table. Two work while third rests.

- One boy to drive the derrick team

- One separator man and engine tender

- One 30x46 separator

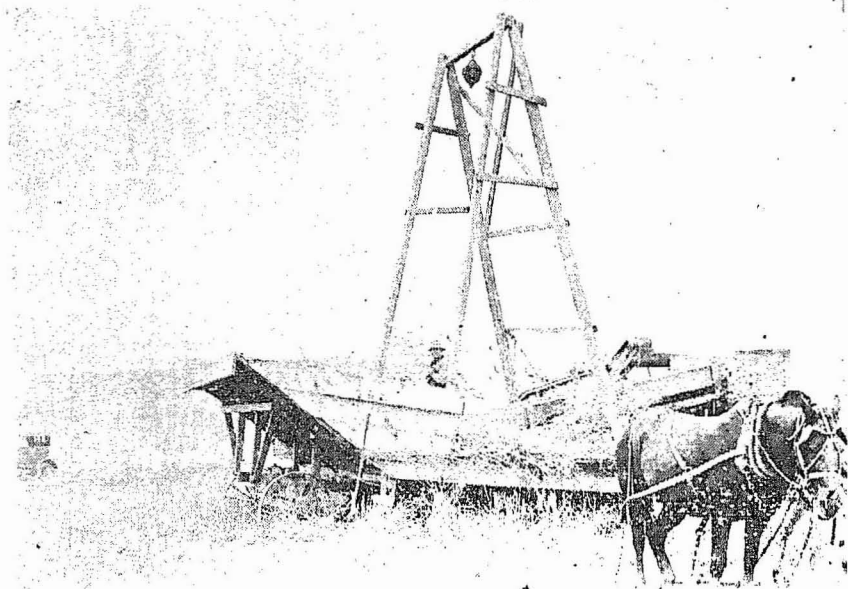


Figure 14—A derrick table, mounted on wheels, for threshing grain direct from the header boxes.

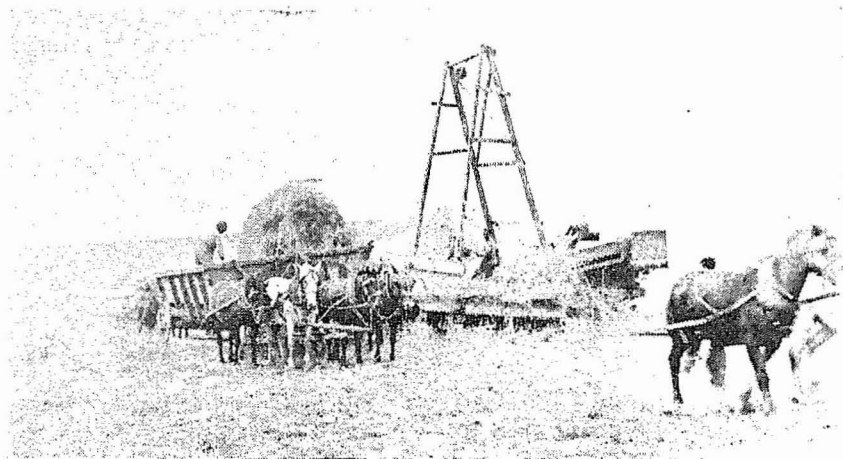


Figure 15—A cable attached to the header box sling rolls the load from each compartment of the header box onto the derrick table hopper. The bottom end of the sling is fastened permanently to the header box. The sling does not trip.

This outfit cuts and threshes from 55 to 60 acres per day in medium grain. It will be noted that compartment header boxes are used, on which nets are permanently attached to the upper sides of the box. The header box is driven up to the derrick table and the load in the net is rolled out upon the hopper of the table. A hook is connected from the wire cable to the ring on the net at the lower side of the box for dumping. The derrick table hopper is in this way given a header box load of grain dumped in one pile where the hoe-down men feed it into the separator.

Since the thresher is of medium size and driven by a tractor, often one man will attend to both if they are both in good working order. (Note 6). Aside from the work required to tend the separator-tractor and dispose of the grain, this crew threshes with about the same number of men that would be used if two header crews were operated and the grain hand pitched to the stack, as is commonly done in Montana at the present time.

If a small separator be used a single header crew will be very economical. Two header boxes, one loader and one or two hoe-down men can be cut off of the crew but, of course, less grain can be handled each day.

Grain disposal is not discussed for either of these crews. Usually field granaries are used to hold part of the grain at each setting, the remainder being hauled to the permanent granary.

Farmers using this system admit it is a little more expensive than combining but that it puts the straw all in one place and permits the easy use of field granaries. In years when the yield is light it probably is more economical to stack and thresh in the regular manner, because this method requires too many headers to keep the separator going at full capacity. Sometimes one small separator is used in connection with three header boxes, the grain being pitched by the header box driver and by a spike pitcher into the self-feeder of the thresher.

The Avery Header-Thresher

Some farmers show interest in the Avery header-thresher which harvests and threshes in one operation. One man drives

Note 6—The Montana Experiment Station bulletin mentioned in Note 4 gives full information about the tractor in Montana.

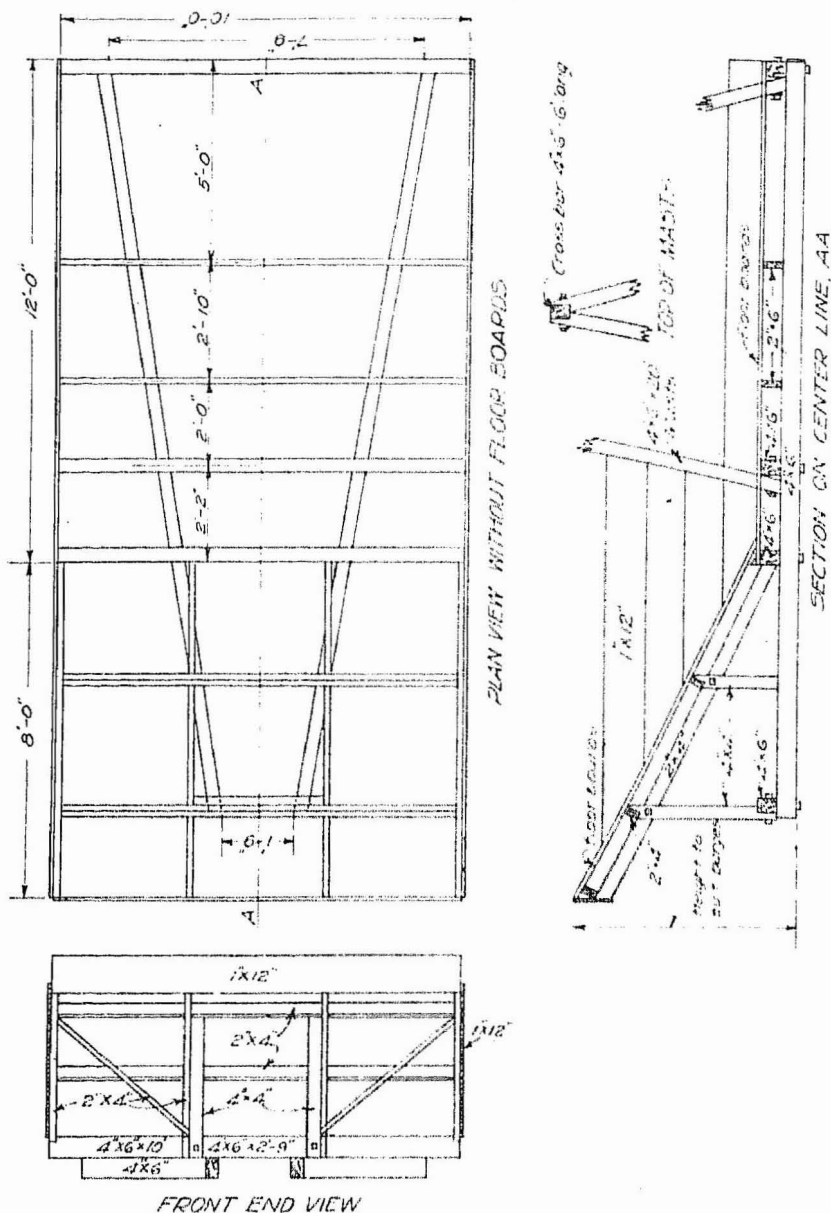


Figure 16—Detailed drawing showing dimensions of derrick table used in threshing grain direct from the header box.

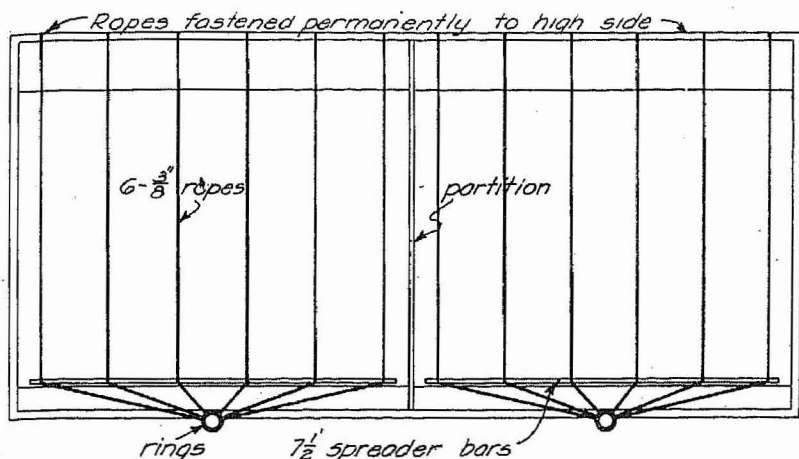


Figure 17—Detailed drawing showing slings in position in each of the compartments of a header box. The cable for dumping is snapped to the rings, the other end of the sling being permanently fastened.

the tractor or horses, another guides the header and a third takes care of the threshed grain in the wagon box and looks after the operation of the header-thresher. A standard header of any make can be used in the outfit. A motor for driving the thresher is mounted in front. The thresher and grain wagon are pulled either by tractor or horse power. The Avery machine will also thresh shocked or headed grain from the stack.

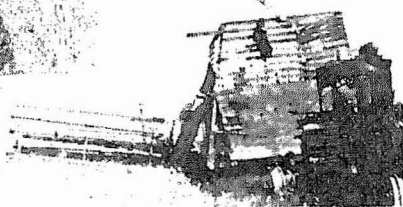
The Hart Header Barge

The Hart header barge, one of the most ingenious labor saving systems found in the whole study of threshing methods, is a Montana invention. It is the invention of C. W. Hart, who operates a 2,700 acre wheat farm near Hedgesville and who is an inventor of national reputation. He is the inventor of the first farm gas tractor in America, the Hart-Parr. He has been using the header barge with success for six years.

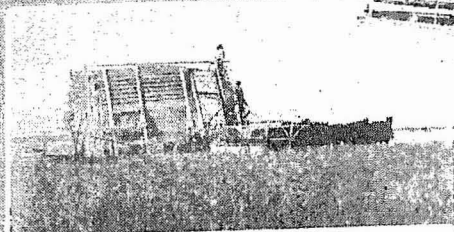
A neighbor who farmed with tractors and kept a large bunch of horses to be used only in harvest, gave Mr. Hart the idea that some system might be devised whereby harvesting could be done with the same farm power and labor that tilled the ground and



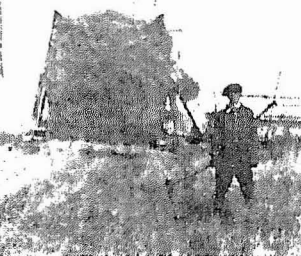
6



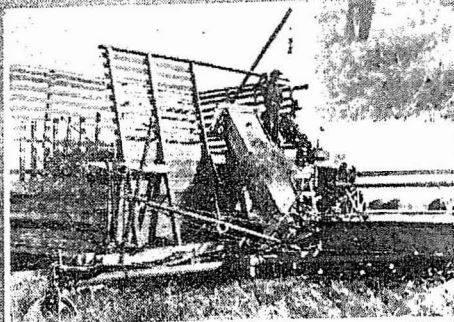
3



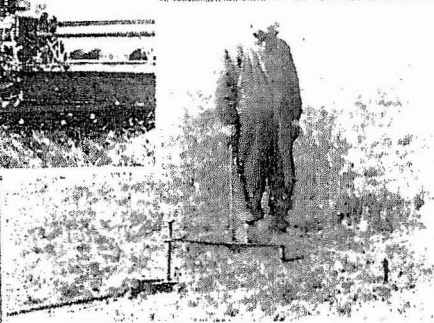
4



5



2



1

Figure 18—See next page.

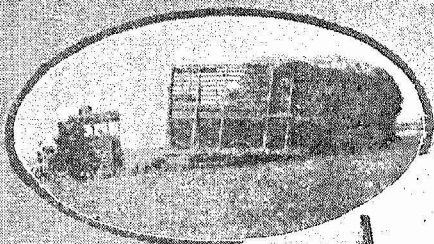
Figure 18—Six views of the Hart header barge in operation. (1) Stakes which anchor the ropes that pull the stack out of the barge. (2) showing the header attached to the barge with elevator in position. A lantern suspended between springs for use in night cutting may be seen in upper right hand corner of this picture. (3) Front view of the header barge and its tractor. (4) Side view of header barge pulled by horses. (5) Rear view of header barge showing stack ready to be "set" and anchored ropes attached to stakes in the foreground. (6) Topping out a stack with the barge moving at half speed.

seeded the crop. The header barge was the result. With one of these barges he now harvests 1,000 acres of wheat per year by running night and day with two shifts of men. Only two men are required to handle the header barge when drawn with either tractor or team, one man stacking and tramping in the header barge, and the other driving the team or tractor. The ordinary header-stacking crew employs six men to do the same work. One of Mr. Hart's ideas in working out this plan was to make himself independent of the often unreliable itinerant labor.

The header barge handles a full stack of headed grain at one operation, instead of the usual header box wagon load. The barge is a box-like affair, 12 feet wide, 12 feet high and 18 feet long. (Figure 19, No. 8). The sides are constructed to give the stack the same "bulge" that a good hand stacker would give it. The rear end is hinged at the bottom to aid in unloading. The box rests on a specially constructed truck, the main weight being carried in a cart-like manner by two heavy wheels in the center. An ordinary header with a 10-foot elevator is hinged by special devices to the frame in such a manner that it is pulled and guided by the barge truck. (Figure 18, No. 2). The hinge also gives the header freedom to adjust itself on uneven land.

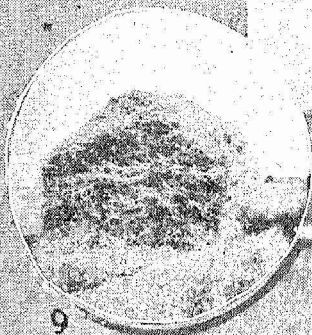
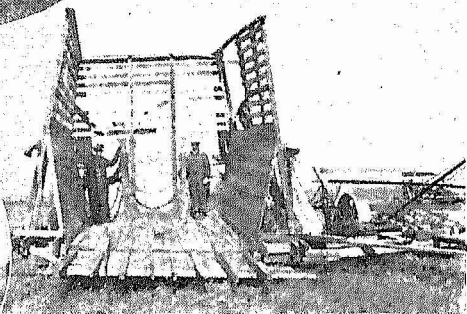
When the grain comes up the elevator from the header the heads all point one way. The stacker in the barge tramps the center well, swings his fork so as to throw the butts toward the outside and in this way makes a thatched top on the stack. Spring wheat is easier to handle for a good thatched top than is winter wheat.

The stacker can make his work fairly easy with little to do except tramp until time to top out the stack. When the barge is about full it pulls more heavily and the stacker has to work



7

8



9



10



11



Figure 19—See next page

Figure 19—(7) As the tractor pulls the barge ahead and the anchored ropes "set" the stack, the barge tilts backwards on its truck as the center of the gravity shifts backwards with the stack. (8) Rear view of the barge showing the end-gate board, the projective bed pieces, the "bulge" form of the stack. The men are standing beside two upright timbers around which the ropes pass and which bind upon the stack to ease it out of the barge. (9) The stack after it is set, showing the marks left by the timbers upon which the anchored ropes exerted pressure. (10-11) Stacks as placed by the barge and ready for threshing. (12) Threshing the stacks, using an extension feeder with side-boards to prevent over-pitching.

more rapidly. If the barge is pulled by a tractor the tractor goes into low speed during the topping out, and if pulled by horses the animals are driven more slowly. The topping out is heavy work but the stacker gets a rest after the stack is dumped as he has little to do except tramp until the barge is half full.

The unloading operation is simple and can be accomplished by the two men in less than five minutes. When the barge is filled in one round of the field, the stacks may be dumped in rows side by side, just as bundles are dropped by a bundle carrier, but where the round does not produce a full load or stack, the stacks may be hauled to a place where they may be grouped in units of three, the reason for which is explained later. (Figure 19, Nos. 10 and 11.)

When the full stack is completed within the header barge, the first operation in unloading is to lower the end-gate. It will be noted that the end-gate when lowered rests upon projecting bed pieces. (Figure 19, No. 8). Each man now takes a maul and they drive two stakes to which are attached ropes which reach around the front of the stack in the barge. (Figure 18, No. 1). On the front end of the stack, within the barge, the ropes bind on upright timbers which make an even pull against the stack when the barge is pulled from under it (Figure 19, No. 8). The anchored ropes ease the stack out of the barge, the barge tilting back as the center of weight is shifted. (Figure 19, No. 7). When the stack is on the ground, the upright timbers and ropes are replaced in the barge, the end-gate is closed and the barge and header continue in the field.

These stacks thresh out an average of 75 bushels of grain each. The headed grain is stacked in molded form, is well packed

and is not disturbed when pulled out of the barge. The stack turns water even better than a hand built stack, and the general opinion is that these barge stacks are superior to hand stacked grain.

In threshing, a separator is set on the side away from the wind and an extension feeder 16 feet long is used, to which there are attached three side boards to prevent over-pitching. (Figure 19, No. 12). Four or five pitchers throw the headings into the self feeder and on Mr. Hart's ranch a crew of five or six pitchers operating a 34-inch separator can thresh a thousand bushels a day. When a number of stacks are in a row the moving of the threshing outfit is done in a few minutes. A cable from the separator to the tractor is about two feet shorter than the distance between the two when the belt is tight. The engineer releases the belt clutch and one man holds the idle belt while another hooks up the cable. This allows the tractor to draw the separator to a new position without removing the belt or taking down any of the machinery. The pitchers hold the extension feeder up until they reach the new location.

Mr. Hart has also threshed his stacks by use of a motor driven combine-harvester, the pitchers throwing the headed grain upon the combine platform canvas. He has threshed about 800 bushels per day in this way, a special kicker being attached in front of the elevator canvas to feed the pitched grain evenly into the machine.

The Hart system of harvesting is, in our opinion, the most economical system devised for farms of 200 to 400 acres using headers on reasonably level ground in Montana. One big advantage is that the barge may be used in windy weather as the sides of the barge break the force of the wind. It has been seen in operation at times when high winds had forced some other types of outfits to quit. The grain is not shattered by the wind when using the header barge and all goes into the stack. The Hart header barge if correctly constructed is very simple, with no parts to get out of order and no intricate machinery to adjust. But warning must be given that proper construction is demanded in this barge if success is to be experienced.

Mr. Hart says that it pays him to run double crews when using a tractor, one working at night, so that from 50 to 60 acres

of grain are cut each 24 hours. For light he suspends two 300-candle power pressure gasoline torches or lanterns high enough in the air that they give a flood of light over the whole operation. The lanterns are hung with springs above and below to take up the jar in driving.

The Hart system has been tried out in both Montana and Kansas. It is past the experimental stage and takes its place as a sound device for economical and rapid harvesting of the wheat crop. Montana people who have used and made these barges express satisfaction with the results obtained.

One Man's Experience with the Hart Header Barge

J. A. Harrison of Living Springs, Montana, built a header barge in 1920 upon specifications furnished by Mr. Hart. The lumber, which was rough lumber from a nearby sawmill, cost about \$75, together with other materials except the wheels. For front wheels he used small but strong iron wheels from a truck wagon and as main wheels the front wheels from a discarded tractor. He used a 12-foot header which he already had but made an extension to the elevator. He says, however, when he buys a new header to replace the 12-foot he will get one 14-foot wide. (Note 7).

Mr. Harrison and his son cut from 400 to 500 acres per year, averaging more than 25 acres per day. It is pulled with a 12-horse team on level land and if the stacks are well tramped and topped out they will withstand wind and turn water better than ordinary hand pitched header stacks. In wet seasons he has no trouble with sprouted grain. In threshing he uses a 30-inch separator with the following crew: four pitchers, one grain hauler, one shoveler, one separator man, and one tractor engineer who assists the stack pitchers when not required to take care of the engine. They thresh from 800 to 1000 bushels per day.

Mr. Harrison says that he would not try to raise wheat in Montana on dry lands without a header barge. (Note 8).

Some Summaries From Mr Hart

In a letter from Mr. Hart, the following points summarizing the benefits of the header barge are outlined:

Note 7—The photograph of the header barge on the front cover was taken on the farm of J. A. Harrison.

1—The labor requirements are reduced from five or six to two or three men, doing about the same amount of field work.

2—The cost of heading is about one-half the cost under the ordinary crew method used in Montana.

3—It is possible in long grain to keep the center high and the stack with butts out.

4—It is possible to head grain with high winds blowing and with little loss.

5—It saves extra man labor when this labor is scarce and high priced, and when at times it even cannot be obtained.

Kansas Type of Header Barge

Stackers of the Hart principle recently have been used in northwestern Kansas, in regions of variable winter wheat yield. An interesting application of this principle is illustrated in Figure

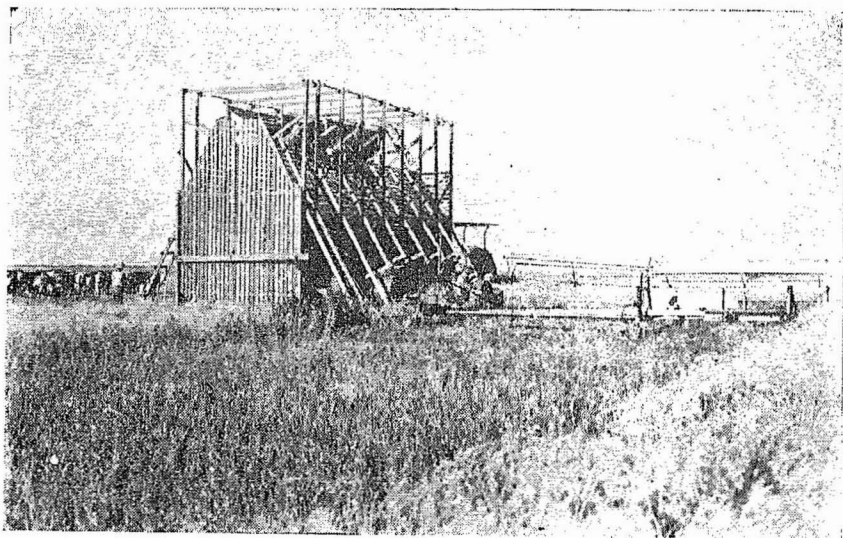


Figure 20—The Kansas type of header barge showing general construction and position of headers at the side.

Note 8—Mrs. Harrison adds an interesting note when she says: "I wish to add that it is a great help to me as I have only two men to cook for during the hot harvesting season since we have been using the header barge. The way we used to run our harvesting I had to cook for five or seven men."

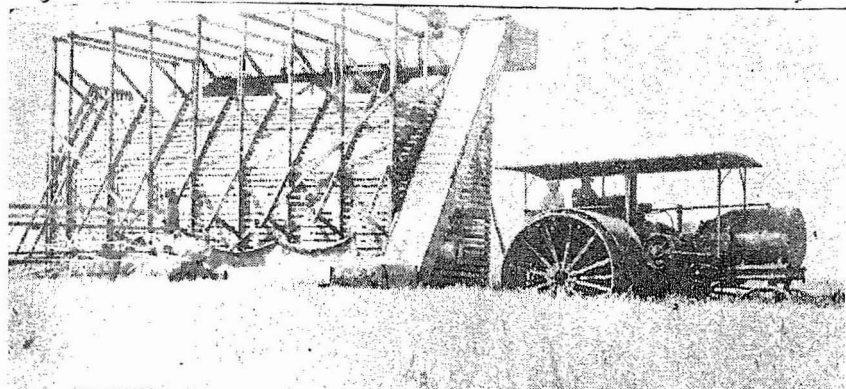


Figure 21—Another view of the Kansas header barge showing the elevator.

20, which represents a complicated type of barge built by Harold Hills of Colby, Kansas. The barge is 30 feet long, 13 feet high and 12 feet wide. Mr. Hills has made a 30-foot header by placing two ordinary headers end to end. An elevator as shown in Figure 21 elevates the grain to the top of the barge. When the grain is light a horse pushed header is driven to the rear of the main header thus cutting a swath 44 feet wide. The principle of using an auxiliary horse push header which discharges on the platform canvas might well be used in connection with the Hart header in years of light grain. The Kansas header description and pictures are placed in this bulletin not with the idea of their being used in Montana but for the purpose of illustrating how the principle of the barge is being used elsewhere on level lands with conditions similar to those in Montana. Recent reports from northwestern Kansas indicate that many farmers who were using the header barge two or three years ago have since gone to the small combine.

The New Way Harvester

As evidence that inventive genius is being applied to the problem of reducing harvesting costs, a South Dakota farmer has invented the outfit shown in Figure 22. A header platform elevates the grain into a round stack mold, the stack mold revolving in such a way that it builds a small stack eight feet in diameter and seven feet high, placing the grain heads in and the straw ends out. These small stacks are carried to the thresher

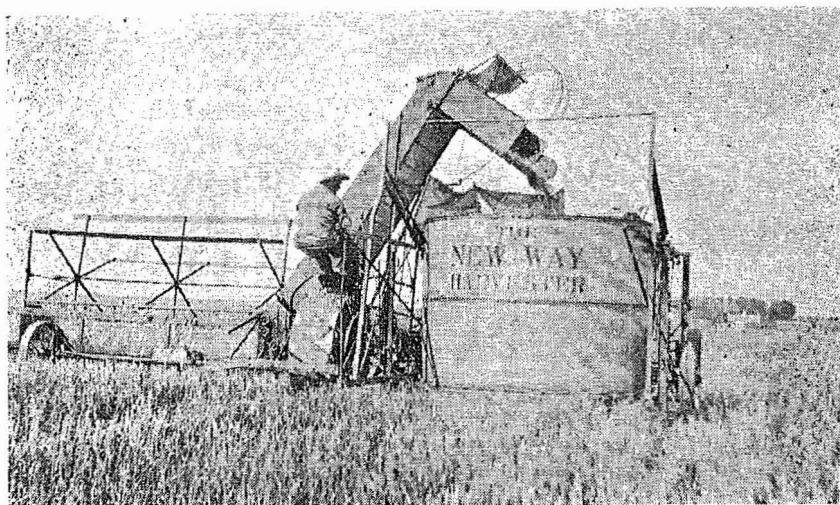


Figure 22—A general view of the New Way Harvester which is being tried out in Canada.

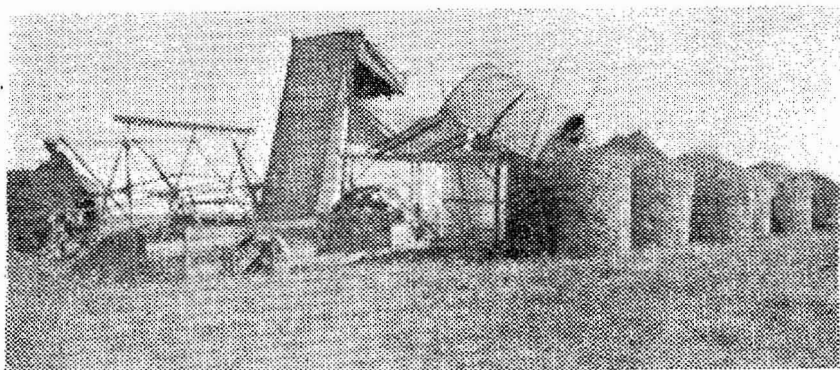


Figure 23—The New Way Harvester placing one of its stacks in position.

with a specially constructed buckrake. The machine still is in the experimental stage. A dozen machines were put out in Manitoba and Saskatchewan last year and, according to an article in the Grain Growers Guide of Winnipeg, Sept. 19, 1923, are giving good satisfaction.

Derrick Table Threshing of Headed Grain Stacks

The theory of headed grain stacks is that they should be long and narrow to facilitate the drying and curing of the grain in the stack. When it comes to the threshing of these stacks, some difficulty is encountered in passing the grain to the thresher feeder. The object of the derrick table system is to substitute horse power for man power in this operation. Such systems are in wide use in sections in which heading prevails. While the size of the threshing crew may not necessarily be reduced, much drudgery is eliminated and a more even feed of grain into the separator is obtained.

The outfit consists of a table to which is attached a derrick. (Figures 24 and 25). The standard table, which is made about 18 feet long and 12 feet wide, is set on top of the running gears of a wagon in the manner of a hay rack. (Figure 26). In threshing, the table is pulled between the stacks, the grain being dragged upon it by means of two large sized Jackson type hay forks. Wire cables extend from the forks to the pulleys on top of the derrick, thence to pulleys on the derrick bed in front, and on to the carts, which are pulled by teams. One fork is used on each side of the table, the system of forking being to keep setting the fork in the stack in such a manner as to pull from the outside toward the center as the load moves toward the platform. In the case of wide stacks, the forker must set his fork alternately on either side of the stack, thus pulling from side to side. For stacks of ordinary width each forkful takes the width of the stack as nearly as possible. Forking may be made either hard or simple work. With a little experience the forker develops an easy system. The grain is kept piled on the front end of the table and a canvas carrier extends from the rear end of the table to the self feeder of the threshing machine. Two men with hoe-down forks rake the headed grain down from the pile into this carrier. The system is well illustrated in Figures 24 and 25.

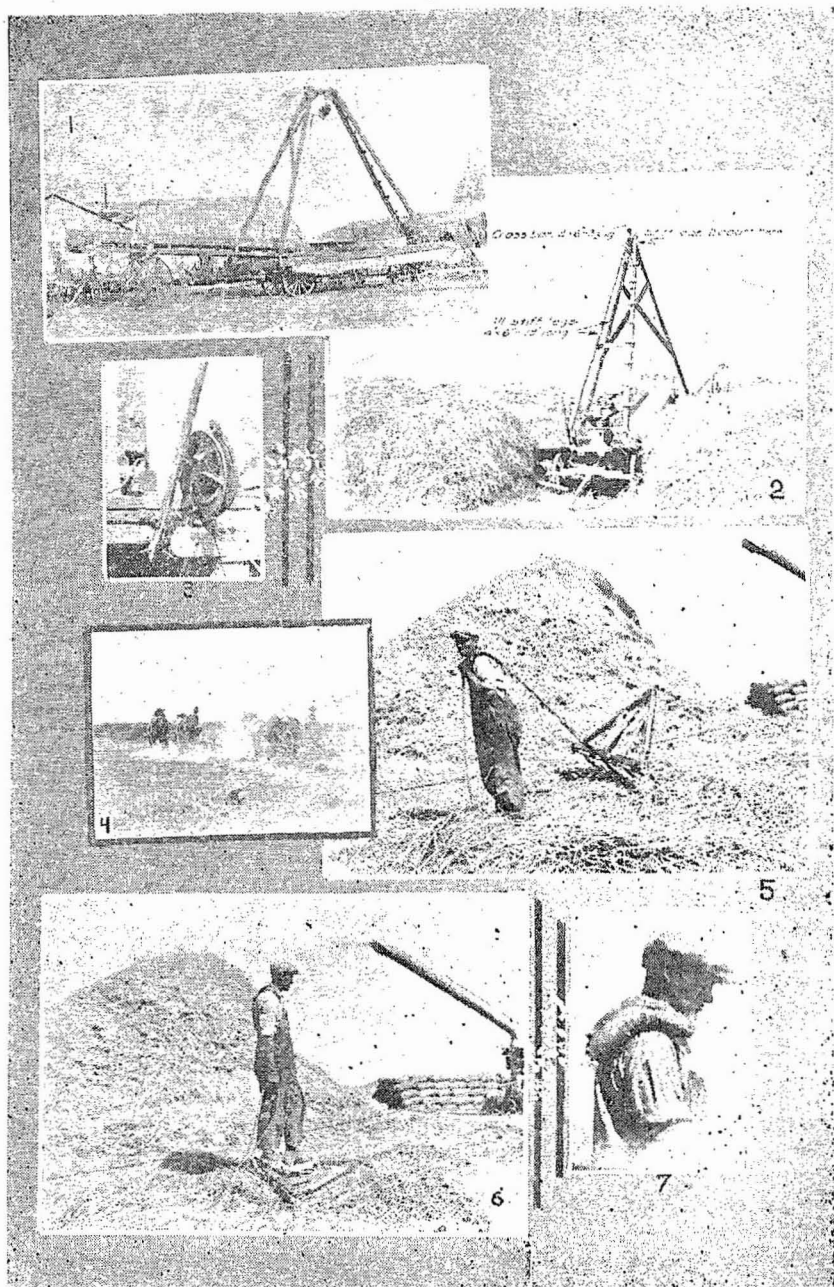


Figure 24—See next page

Figure 24—Views of the derrick threshing table. (1) General view of the derrick table and the self-feeder which moves the grain from the table to the separator. (2) The derrick table in place between the stacks. Just above the front wagon wheels, on the table platform, are the pulleys against which the two teams pull. Cables run from the teams through these pulleys, then to the top of the derrick, and from there to the forks out on the stacks. As the teams pull ahead the grain is pulled in by the forks to the table. As the grain load reaches the top of the pile the forker trips his fork. (3) Close view of the pulley on the table platform. (4) Teams with two-wheeled carts pull the cables that drag the grain to the derrick table. The carts eliminate the handling of double-trees by the driver when the pull is completed and the team goes back. (5) After the load is tripped on the table, the fork-man pulls his fork back to the end of the stack by means of a rope over his shoulder. (6) When his fork has a new "bite" the fork-man signals to the team driver and then, as the cable pulls, rides his fork almost to the table so that it will not pull up and take only a part load. (7) A piece of an old collar pad worn over the shoulder of the fork-man prevents cutting by the rope as the fork is dragged back into position.

Bundle Loading

Mechanical shock loaders as shown in Figure 27 have been used to only a limited extent in Montana. The general impression seems to prevail that they do not save enough labor to justify their use. With the outfit shown in Figure 27 the shock loader, which is pulled by four horses, keeps seven bundle wagons going. One man follows the shock loader, gathering with a fork those bundles which fall off the wagon or are missed by the loader. The bundles are run into a header box wagon. The man who operates this outfit claims that by means of the loader he can handle as many bundles with the loader and seven wagons as would require 12 bundle wagons under ordinary threshing operations.

Threshermen are not agreed as to whether it is more economical to have the bundle wagon hauler do his own field pitching or to use a system of regular field pitchers whereby each bundle wagon teamster loads his own bundles into a basket rack. The principle seems to be that if field pitchers are used, less bundle teams are required, and, because the bundles are systematically

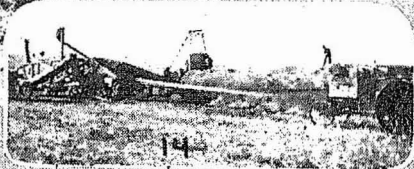
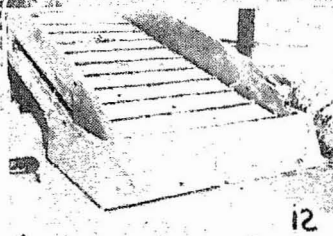
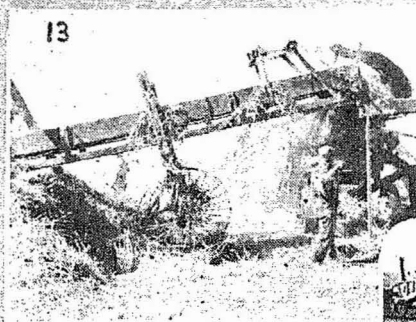
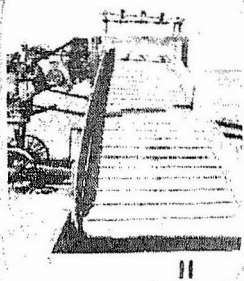
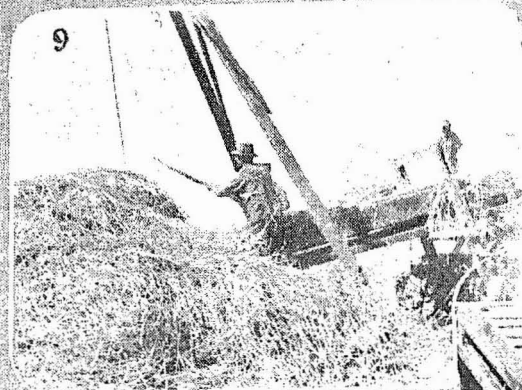
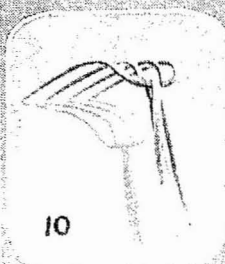
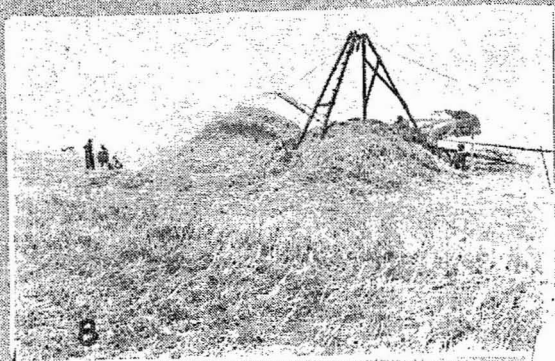


Figure 25-- See next page.

Figure 25—(8) The headed grain is pulled from the furtherest end of the stack to the table. The grain is kept piled high on the table. The stack on the right has been cleaned up. (9) Hoe-down men with special forks pull the grain from the pile into the self-feeder of the separator, insuring an even feed. (10) One of the hoe-down forks showing the curved tines. A piece of leather passes about the metal and is nailed to the handle so that the steel tines cannot get loose and go into the separator if the fork breaks at the joint. (11) The self-feeder that runs from the derrick table to the separator. (12) The boxed base of the self feeder that rests on the derrick table. (13) Showing details of the self-feeder from the derrick table to the separator. A tin shield prevents grain from going over the separator feed canvas. Near the separator it a pulley-operated set of "kickers" which keep the grain moving evenly. A pair of wheels under the self feeder make moving a quick and simple operation. Here one of the hoe-down men is cleaning up under the feeder, pitching spilled grain and heads into the separator. (14) The outfit set and ready to thresh. A load is being lifted upon the derrick table.

table.

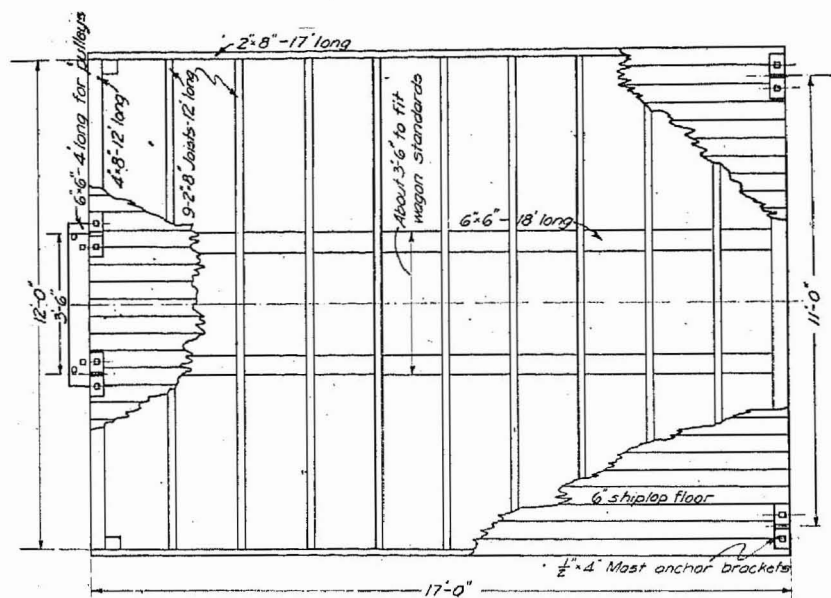


Figure 26—A detailed drawing of the floor plan of the derrick table.

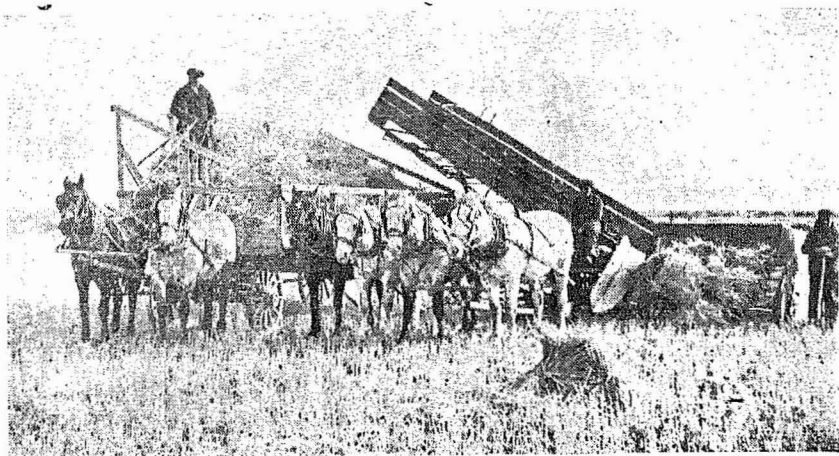


Figure 27—The bundle loader in operation. An extra man with a pitchfork walks behind to pick up bundles that fall from the loader or the load. This outfit takes a spike pitcher at the machine because the bundle loader picks up bundles "any old way."

arranged on the rack, no spike pitchers are required. However, horses usually are plentiful at threshing time and a majority of threshermen, especially in districts where the shocks are not thick, prefer to use more wagons and no field pitchers.

Mr. Noble of the Noble Foundation experimented by using large bundle racks drawn on low wheeled trucks by four horses. He built a dumping platform with a sloping bottom and a mechanical conveyor in the center which he placed in front of the threshing machine. The specially constructed bundle wagon was driven in such a manner as to place the rear end over this platform. A team with block and tackle now pulled back the front end of the bundle rack, thus dumping the load of bundles on the platform. Spike pitchers then fed the bundles into the conveyor. Mr. Noble, however, gave up the plan after using it two years because there was too much mechanism connected with it, loss of time in digging the wedged bundles out of the bundle pile, and unevenness of the feed.

Small Threshing Outfits

With ordinary binder methods on medium to small sized farms, small threshing outfits with cylinders of 20 to 26 inches

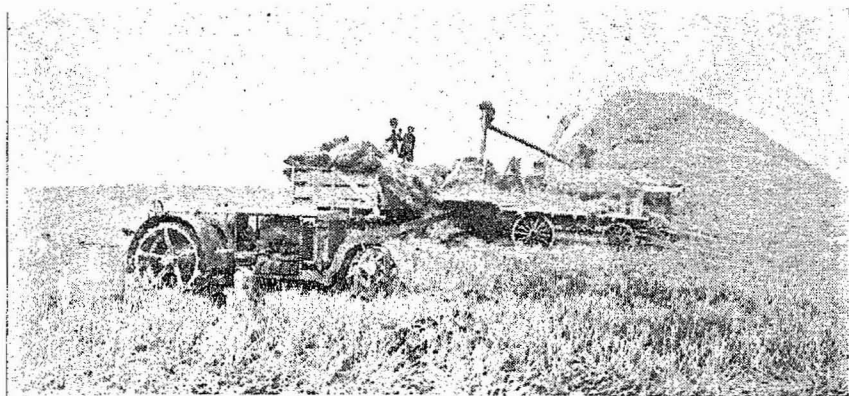


Figure 28—A threshing outfit at work. A type of many small outfits found in Montana.

and which are operated by, say, a 15-30 tractor, are growing in popularity. By means of such an outfit a few neighbors can club together, exchange work and do their own threshing. A good mechanic who understands a thresher can tend both the tractor and the separator if they are kept in good running order. The ordinary crew for such an outfit consists of five basket-rack bundle wagons, each bundle hauler doing his own loading; one spike pitcher at the machine and one grain hauler and a grain shoveler at the bin. Such an outfit will thresh in the neighborhood of 1,000 bushels of wheat per day. Many men who have used both the small outfits and large outfits on dry land grain, believe the small outfits to be most economical. It is not the object of this bulletin, however, to enter into a discussion of bundle grain threshing and the many problems connected therewith. This type of threshing is familiar to all Montana farmers and there is but little to be said regarding further labor economy in this method.

Labor Economy

The following section deals with labor economy in connection with the handling of grain from the separator. Usually there is a shortage of labor at threshing time. The following suggestions have to do with taking care of grain from the thresher in the

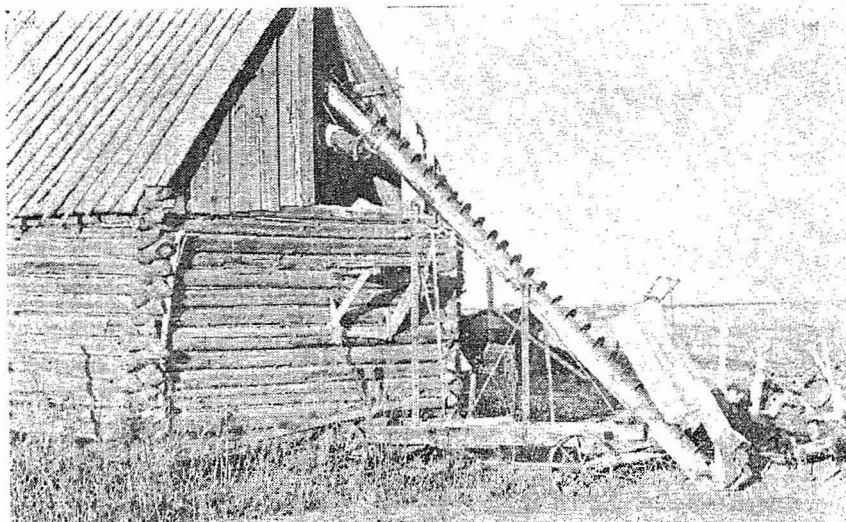


Figure 29—Portable mechanical elevators, operated by power, save much shoveling at the bin.

most economical manner.

It is customary with large thresher crews in which the thresherman supplies all the bundle wagons, for the farmer to take the grain away from the separator. Much hand labor can be saved by the use of power portable mechanical elevators as shown in Figure 29, thereby eliminating the hand shoveling. Often such elevators are supplied by the thresherman who makes a small charge for their use. The elevator will substitute for two grain shovelers at the bin.

Field Granaries

Many farmers are building portable field granaries on skids rather than expensive central granaries. These portable granaries may be hauled into the field and placed in position at the various settings so that the grain is directly spouted from the separator to the granary. Good types of granaries are shown in Figure 31.

A cheap, emergency granary which is growing in favor in dry land districts where the grain is to be hauled immediately to the elevator is shown in Figure 30. Woven wire is used to make

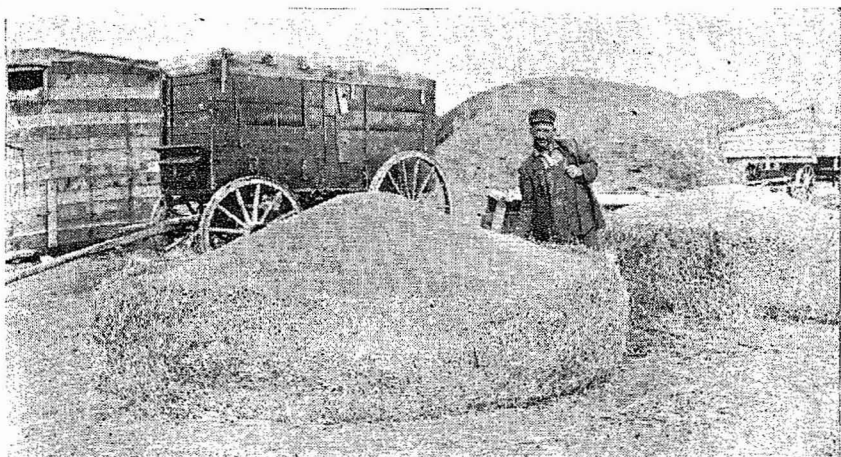


Figure 30—A circular tank of wire netting, lined inside with straw of grain bundles, makes a handy field granary.

large round tanks, the inside being lined with grain bundles. Such tanks are made any height desired. Of course with such a system the farmer must realize he is taking some risk of wet weather although they may be covered with tarpaulin.

Combine Harvester-Threshers

Combine harvester-threshers, where conditions are such as to safely justify their use, are by all means the last word in labor economy in wheat growing. Low prices of wheat, together with the tendency to increase the number of acres of wheat per man through the use of tractors and big teams, have greatly stimulated the interest in combines in Montana. The combine question is continually debated by wheat farmers in such wheat counties as Fergus with ardent champions on both sides. A complete discussion of combine harvesting is not within the limits of this bulletin. However, we will put out both sides of the question, point out the conditions where combines are successful and give a summary of the experiences of a typical group of farmers who are using them.

The farm management demonstration section of the Montana Extension Service estimates that there are between 150 and

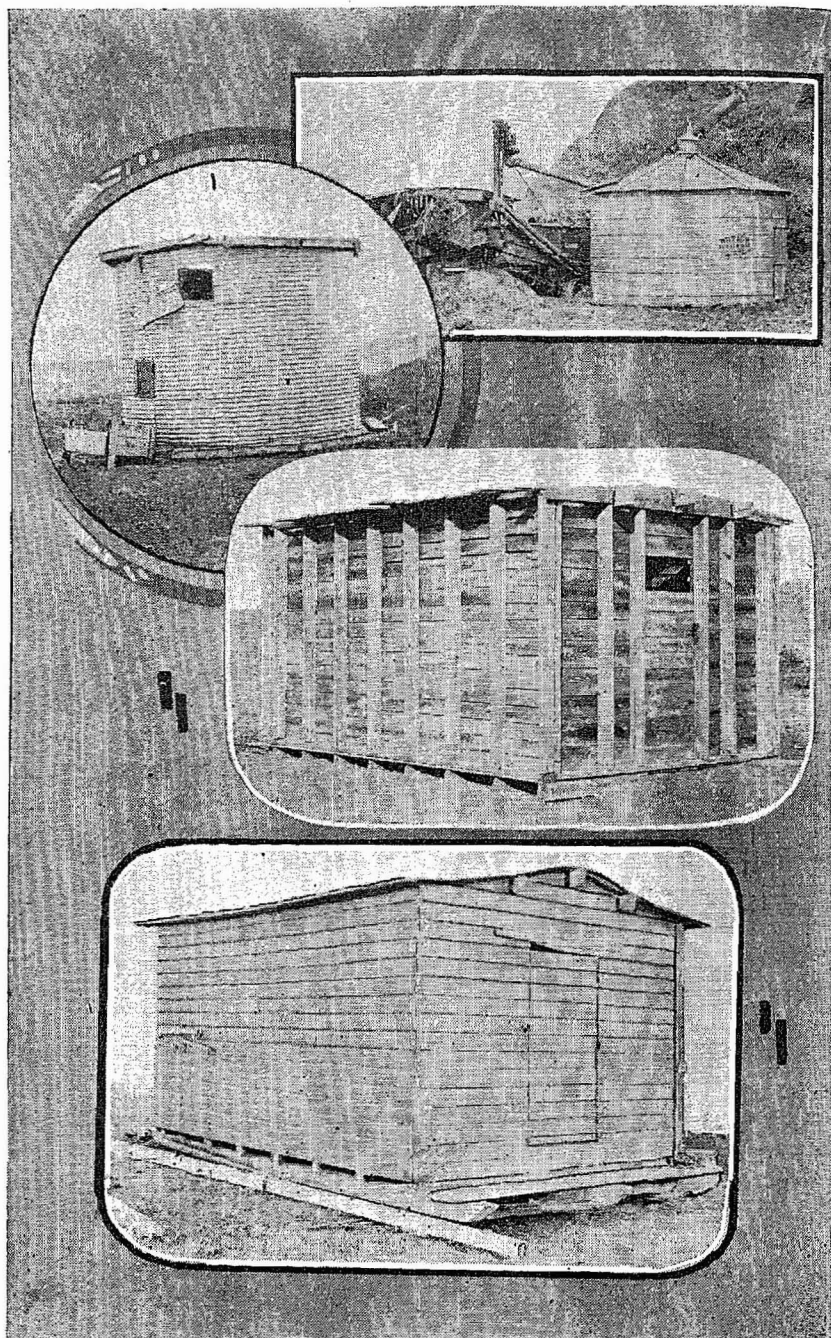


Figure 31—Some types of granaries.

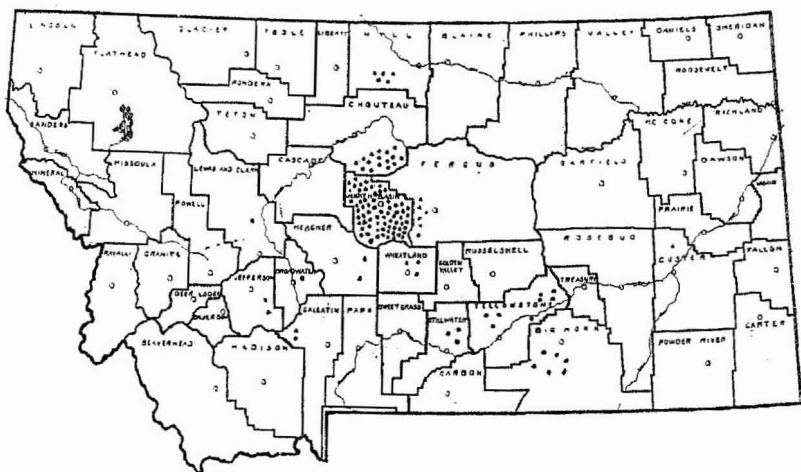


Figure 32—A map showing the location of combines in Montana.

175 combines in Montana. Figure 32 shows an outline map of Montana in which those known to the extension service are located. It should be noted that the bulk are within the four counties of Fergus, Judith Basin, Chouteau and Cascade, with a few scattered in the counties to the south. The Judith Basin, with its adjoining wheat area where the combines are most numerous, is level bench land of rather uniform soil. Winter wheat and spring wheat both are raised. Wheat raising here is perhaps on a larger scale than elsewhere in Montana. Undoubtedly there are sufficient reasons why combines have a foothold here, yet it is doubtful if this section has more favorable weather as far as combining is concerned, than the plains section of the state east to the Dakota line.

That the situation may be put clearly before us let us list the advantages and disadvantages of the combine from the farm management standpoint in Montana.

Advantages

- 1—Reduces harvesting costs to a minimum.
- 2—Permits, on a medium sized grain farm, the labor which put in the crop to harvest it.
- 3—Small combines often allow family labor to harvest a crop without hired labor.
- 4—Gives more time for fall work.

Disadvantages

1—Increases the crop risk in relation to weather by prolonging the cutting period. Danger from hail, rain, wind and snow.

2—Large capital investment.

3—Loss of part of the straw often wanted as stock feed.

Without doubt combines are in Montana to stay as far as certain types of farms and particular localities are concerned, but it must be remembered that the Montana harvesting season is different from California and the Pacific Northwest, where combines are regularly used. Much is yet to be learned about the combine in Montana.

Types of Combines

There are two distinct types of combines in use in Montana.

Large Pacific Coast Type—These range in size from 18 to 24-foot cut, with a capacity from 25 to 60 acres of grain per day. They range in cost from \$2,000 to \$5,000, depending upon size, type of power, etc. The usual crew consists of a tractor or big team driver, a header tender who adjusts the sickle and cutting mechanism, one combine man and, where sacked grain is required, two other men as sackers.

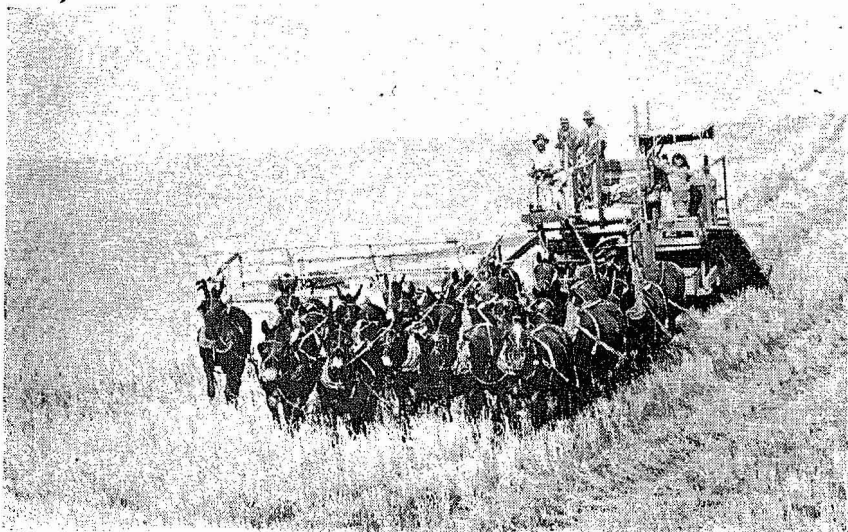


Figure 33—The large Pacific Coast type of combine.

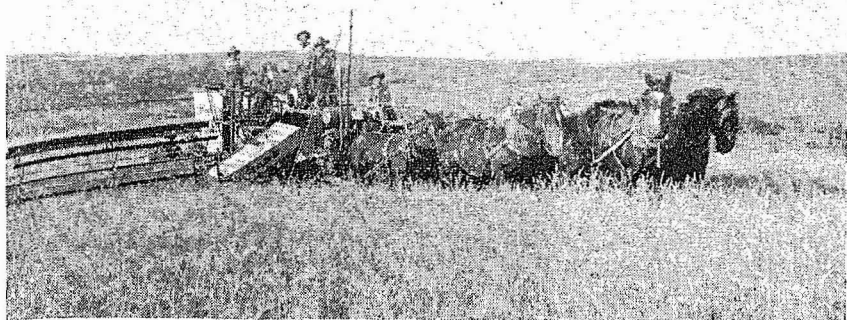


Figure 34—A small type of combine found in Montana

Small combines—During recent years manufacturers have been building combine harvesters which are patterned after the large Pacific Coast type, but with a smaller cut, the standard cut being 12 feet, although some of nine-foot cut have been built. During the last five or six years this type of harvester thresher has had a wide sale in the wheat districts where headers had been commonly used before, notably in Oklahoma and western Kansas. They are designed for the medium sized grain farm. They sell in Montana at from \$1,500 to \$2,000.

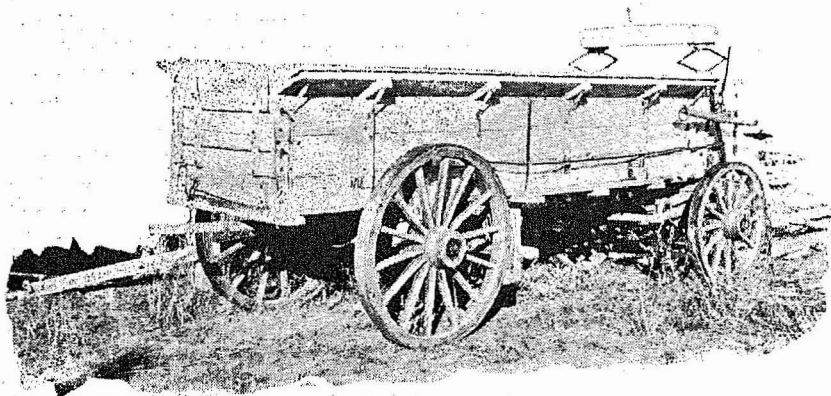


Figure 35—A good type of home made grain tank for hauling from the combine to the elevator or grain bin.

The regularly equipped outfit contains a gasoline motor which drives the thresher. On reasonably level land it is pulled by an eight-horse string team or tractor of about 15-30 horse power. The crew required depends on the method by which the harvester is pulled and upon the grain disposal. If drawn by horses, the driver also tends the combine, the header and machine levers being close by his seat. If tractor propelled, in most cases one man drives the tractor and another tends the combine. The number of grain wagons, of course, depends on the yield of grain and distance of hauling. In the majority of Montana cases, three, four or six-horse grain wagons are used. (See Figure 35).

Montana Combine Experience

Since the combine has not long been in use in Montana, (nor are they yet in common use) it is thought best in this circular to let the men who have been using them tell the story. To obtain information, a letter of inquiry was mailed to a list of Montana combine users, estimated to be three-fifths of the total users of combines in the state. For the 110 inquiries sent out, 45 answers were returned.

Costs of Combining

It is evident from a study of the replies that cost per acre will vary widely. The average cost per acre given by Montana combine men is a little more than \$2 where grain yields from 15 to 20 bushels per acre. These men haul their grain in bulk and do not stack it. The figure is perhaps a little low. Accurate cost studies in the states of the Pacific Coast indicate that during the past few years their costs have been from \$3 to \$3.50 per acre. The Montana farmer who is planning to purchase a combine should figure his own possible operation costs on a basis of amount of labor required to combine and dispose of the grain on the farm, rather than upon a dollar-and-cents basis which will vary with yields and prices.

Below are given the questions asked combine men in Montana, the "yes" and "no" answers returned by them, and a few sentences from letters they wrote to explain more fully their answer. These questions, answers and observations are given as received, for whatever use they can be to the farmer-reader of this bulletin.

—1—

Q—Have you had trouble because of wet weather?

A—21 replied "no;" 19 replied "yes."

What they wrote—"Montana weather is fair for combines. You will get a bad fall once in a while, but you get this with any method of harvesting."—Fergus Co. "I have cut spring wheat laid flat with snow, and had no waste."—Judith Basin Co. "Wet weather will slow you up but don't let this

worry you. Grain will stand wet weather better standing than in the stack."—Fergus Co.

—2—

Q—Did you have hail damage that would not have occurred under some other method of harvesting?

A—37 replied "no;" 3 replied "yes."

What they wrote—"Hail damage comes before harvest." "Hail will damage shocked grain nearly as bad as standing grain."

—3—

Q—Is the risk of hail damage too great to justify the combine in Montana?

A—39 replied "no;" 1 replied "yes."

What they wrote—"We run risk all through the growing season; a couple of weeks more is little extra risk." "I have lived here forty years and have never seen hail in August but once." "If the grain is insured the insurance holds until it is cut with a combine. If cut with a binder the insurance does not hold after it is cut and we all know that a great deal of damage can be done after the grain is in the shock."

—4—

Q—As far as weather is concerned, can you combine whenever you can head?

A—30 replied "yes;" 10 replied "no."

—5—

Q—When wheat is ripe, is shattering a problem because of wind or overripe condition?

A—38 replied "no;" 2 replied "yes."

What they wrote—"To some extent, but we have done better with combine than with header." "Not in winter wheat but a little with Marquis wheat. It shatters just as it is getting ripe. After that it cures and becomes tough again and will stand until snow falls." "As an experiment I allowed a small field of Marquis to stand until October in 1923. It did not shatter."

—6—

Q—Which shatters most easily, winter or spring wheat?

A—34 replied that spring wheat shattered most easily; 6 replied that it was about the same for both kinds of wheat.

—7—

Q—Have you had trouble from uneven ripening of grain?

A—32 replied "no;" 8 replied "yes."

What they wrote—"Yes; in low spots and on north slopes."

—8—

Q—Have you had trouble with green Russian thistle tips in combining?

What they wrote—"Had to give up combine one year and use headers for this reason." "Give machine more speed and more time." "Will thresh it but grain is damp."

—9—

Q—Does combine wheat take a lower market grade than wheat harvested in other ways?

A—31 replied "no;" 9 replied "yes."

What they wrote—"Cut five cents once because it was bleached." "Lost in color but made up in weight; always first grade." "Have clearest and best grain that goes to our elevator."

—10—

Q—Do you sack grain from the combine or run it into a wagon drawn beside the combine?

A—37 replied that they run it into a wagon; 3 that they sack it.

—11—

Q—Do you use a weed seed and dockage cleaner on the combine?

A—22 replied "no;" 18 replied "yes."

What they wrote—"Would not be without it." (None of those who bought machines with grain cleaners reported taking them off; all were enthusiastic about them.)

—12—

Q—Do you gather the straw or chaff?

A—37 replied "no;" 3 replied "yes."

—13—

Q—Have you had trouble with combined grain heating in the bin?

A—31 replied "no;" 9 replied "yes."

What they wrote—"Some from first cutting and green spots." "Yes; when cut too soon after rain. A few times I put fence posts in the bin." "Some caused from Russian thistles." "Elevator dried it for me."

—14—

Q—Have you used your combine for threshing headed grain or bundle oats?

A—32 replied "no;" 8 replied "yes."

What they wrote—"We thresh our oats that way." "Most economical way in the world to thresh header stacks." "Yes; can thresh more economically than a regular thresher. I pay all my harvest expense from money I take in that way."

—15—

Q—How much grain should a farmer have to justify use of a combine?

A—Summary of replies shows they favor 150 acres and up for the small type of combine; 400 acres and up for the large Pacific Coast type combine.

—16—

Q—On the basis of your experience, can you recommend the combine to Montana bench land farmers who have uniform soil and slope?

A—35 replied "yes;" 4 replied that it "depends upon the individual;" 1 replied "no."

What they wrote—"According to help and wages we could not get along without it." "The only way we can raise wheat at a profit at present prices."

"It is cheapest way, including hail insurance." "Has 50 per cent advantage over any other method where thistle and green stuff does not interfere." "I think any man who raises 200 acres of wheat should have a combine if he doesn't need the straw pile."

Some Experiences With the Combine

Stillwater county—12-foot combine—250 acres wheat—horses used for power: "Costs me four to five cents to put wheat in bin. I save one or two bushels per acre over other methods. Have used it three years. I drive eight horses on combine and tend it myself. One member of the family drives the grain wagon with the combine while an old man hauls to elevator three and a half miles away."

Fergus county—12-foot combine—Bought in 1920—Cost \$1850—Pulls with 15-30 tractor—Tractor driver also tends combine—Two grain haulers. "The combine is the only way I can make anything raising wheat at present prices."

Fergus County—12-foot combine—Cuts 400 acres each year—Uses horses—one combine tender and driver, two grain haulers. "The first cost of a combine is very big, which makes it hard to pay for with 75c wheat. It is the best and only way to harvest as it is easy to get two or three men to haul wheat. You know how hard it is to get seven or eight men to stay three or four weeks for heading and threshing."

Judith Basin County—12-foot combine—Two people of one family harvested 300 acres of grain. "I drive the eight-horse combine team, grain wagon attached to combine; another member of my family hauled grain to elevator. This year we harvested 300 acres of crop without one cent for wages."

Cascade County—"The way wheat prices have been, I could not farm without a combine. When you cut a big acreage with binders and pay 15 cents per bushel for threshing, there is nothing left."

Chouteau County—"In these high price times, I, with two members of my family, have harvested 300 acres with no cash expense. We have saved money."

Fergus County—"If we had to go back to the old methods of binding, shocking, and all the items that go with it, we are sure we could find a business that would be a lot more profitable than wheat raising, with wheat at its present price. This means that it must be produced at the lowest possible cost per bushel and we know of no other way to economize and save as much as with a combine."

Efficient Production Needs Award

It has long been the custom to promote agriculture by offering prizes for the best grain and livestock produced. It would be as justifiable and perhaps as important (If it were not such a complicated matter) to offer prizes to men who, through care and good management, produce crops at the lowest cost. The following experience of Mr. Hart and Mr. Sheffels might easily be entered if we had a statewide competition on economical wheat harvesting in Montana:

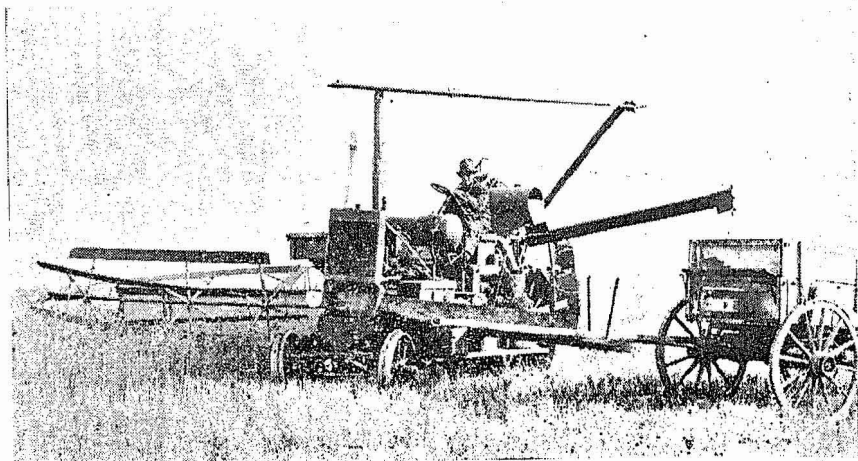


Figure 36—C. W. Hart's harvester thresher. One man operates the outfit, like driving an automobile. Electric lights may be suspended above for night work

C. W. Hart's Combine Experience

Mr. Hart, who is referred to in other parts of this circular, as the inventor of the Hart header barge, has established a record for low cost combine harvesting. He mounted a Day-Elder truck motor on a combine harvester in such a way that it both propels the combine and drives the thresher. A regular farm grain wagon is hitched to the combine, the grain spout discharging into same. When one wagon is full, it is dropped and replaced by an empty wagon. The grain is hauled 14 miles to elevator by auto trucks. Three men harvest and haul to the station. A small dynamo attached to the motor supplies the light for night running.

Mr. Hart thinks that the combine is a success, but that a system of drying the grain will be necessary in damp years. He has met this problem by designing the elevator or grain bin shown in Figure 37. On one side of the dump a 15-30 tractor drives a high pressure rotary foundry fan. The grain is carried by this column of air in a 6-inch stove pipe from the dump bin to the top of the bin shown in the right side of the picture. Such an outfit is inexpensive and is used both for drying and loading wheat. Mr. Hart has experimented with damp wheat and finds that the air currents thoroughly dry the same.

Robert Sheffel's Experience

One of the most efficient grain farms in Montana is operated by Mr. Robert Sheffels & Sons at Goodell Siding, about 10 miles north of Great Falls. The field is near the siding, where Mr. Sheffels has built an elevator. He harvests with a 24-foot cut Pacific Coast type of combine, pulled by a

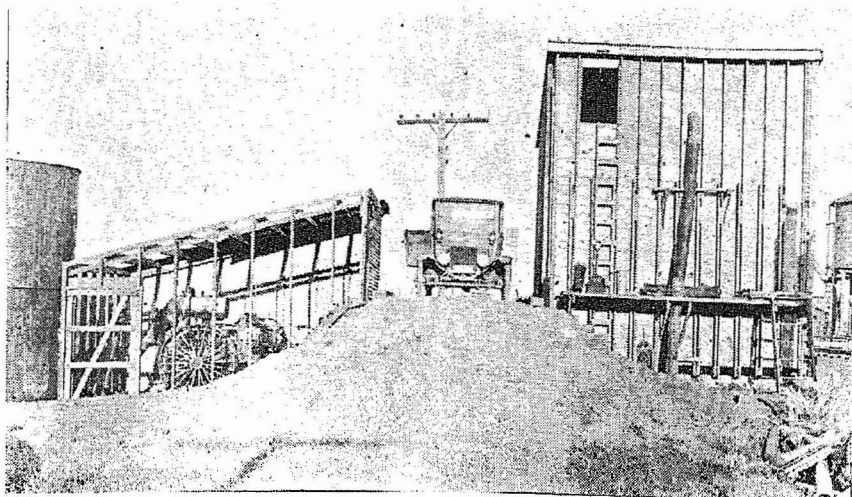


Figure 37—Mr. Hart's elevator, used for conditioning damp combined grain.

caterpillar tractor. The combine discharges the threshed grain into a 120-bushel elevator double hopper grain tank drawn on a caster wheel on the stubble side of the combine. The grain is hauled from this elevator grain bin to the elevator in a Ford truck. The truck drives beside the elevated tank and by opening two spouts on the hopper bottom it is filled with 60 to 70 bushels of grain in less than two minutes while the outfit is moving. The truck now is driven to the elevator to unload.

The crew consists of four men as follows: one tractor driver, one combine man, one header puncher, one truck driver. They cut from 80 to 100 acres per harvest day. The cash outlay for labor, gas and oil amounts to about 70 cents per acre.

(Description of figures on next page)

Figure 38—Summary comparison of harvesting methods. The gist of this based upon an estimate of 18 miles travel per day in grain yielding about entire circular is in this pair of drawings. It is impossible to compare these different methods accurately, as each farm, each crop, each season, distance from market, etc., would all make a difference. All methods are slowed up in heavy grain. The chart is simply an attempt at summarizing facts gathered by the farm management demonstrator in north central Montana in the fall of 1923. The crews represented in connection with shock and header threshing are medium sized crews. Of course, the hours required to thresh a given quantity of grain grow fewer as the size of the crew increases. The rate for horse drawn harvesting implements (binders, headers, etc.) is based upon an estimate of 18 miles travel per day in grain yielding about 15 bushels.

Various systems and equipments for wheat harvesting

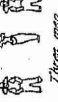
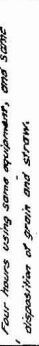
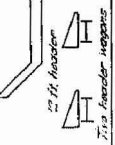
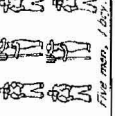
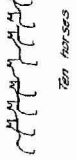
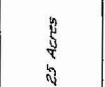
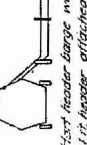
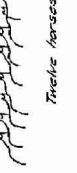
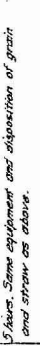
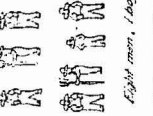
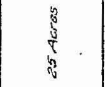
Implements	Men required	Horses necessary	Acres	Threshing equipment and time
 3 ft binder	 Two men	 Five horses	 17 Acres	 Time for 10 men to pitch grain into stack Grain in farm granary, straw in stack.
 12 ft push binder	 Three men	 Six horses	 22 Acres	 Four men using same equipment, and same disposition of grain and straw.
 12 ft header 12 ft header wagon	 Five men, 1 boy	 Ten horses	 25 Acres	 9 men hand pitching four horses applying grain 4 hours. Grain in farm granary, straw in stack.
 12 ft header barge with 12 ft header attached	 Two men	 Twelve horses	 30 Acres	 5 hours. Same equipment and disposition of grain and straw as above.
 Small separator, tractor, and derrick table 14 ft header Two header wagons, 2 men	 Eight men, 1 boy	 Sixteen horses	 25 Acres	 Grain in field and farm granaries, straw in stack.

Figure 38—See page 51.

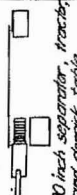
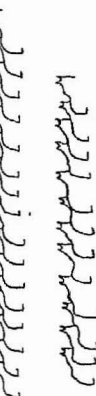
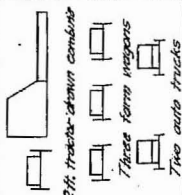
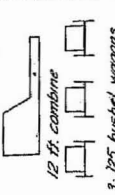
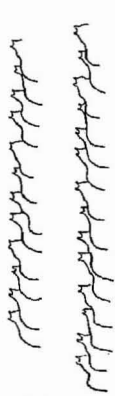
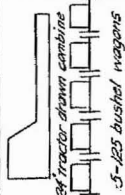
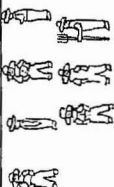
 30 inch separator, tractor, and driver table. Two 12 ft. Headers 4 header wagons 2 grain wagons	 15 men 1 boy	 Twenty eight horses	50 Acres	Grain in field and farm granaries, straw in stack.
 12 ft. tractor-drawn combine Three farm wagons Two auto trucks	 Two men	No horses	25 Acres	Grain at station 14 miles distant, straw on field
 12 ft. combine 3-125 bushel wagons	 Four men	 Twenty six horses	25 Acres	Grain at station 8 miles distant, straw on field
 24 ft. tractor-drawn combine 3-125 bushel wagons	 Seven men	 Twenty horses	50 Acres	Grain at station 8 miles distant, straw on field

Figure 29—A continuation of Figure 38.