BIG TEAMS IN MONTANA

BY

M. L. WILSON

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Big Teams in Montana

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FOREWORD

In presenting a publication of this kind it becomes impossible for the author to give credit to the many scores of farmers and scientists who have helped toward its completion. The reader is reminded that this is all material direct from the big team farms of the northwest, and that in every paragraph he is reading the information gathered from men who have for years been handling big teams.

Perhaps special mention should be made of the fine cooperation of such men as Lloyd "Shorty" Talkington of Harrington, Washington, Gilchrist & Sons and other farmers of Montana, C. S. Noble of Noblesford, Alta., the officials of the Horse Association of America, and various members of the Montana State College faculty who have helped in the gathering and preparation of this text material.

For the scores of persons who have given valuable aid we must, without trying to list all of the names, acknowledge here that their fine cooperation has been appreciated, and that the highest evidence of this appreciation of their assistance will come from those farmers who find in the bulletin something that will help them in the solving of their big team problems.
BIG TEAMS IN MONTANA
By
M. L. WILSON, Specialist in Farm Economics
For
The Montana State College Extension Service

Introduction

THE big team came into use in Montana in the days of the gold rush. That is not a very great time ago, since there are still living in Montana many men and women who came west in covered wagons in days when the gold fever swept thousands of people into the new communities at Bannack, Alder Gulch and Virginia City. Yet in terms of years it has been long enough for that period of big team freighting to flourish, decline, cease and be forgotten; and for a few decades to pass before renewed interest in the use of big teams springs up in a generation of men that never knew or had almost forgotten the big team experiences of those earlier days.

It is in a comparison of the big team freighting days of the 'Sixties and 'Seventies with the increasing interest in big teams on the dry land farms of Montana today, that this introduction wishes to hold the reader's attention for a moment. Conditions that brought about the use of big teams in both periods of the state's history are here presented as analogous, if not parallel.

In the middle 'Sixties thousands of pioneers came across the Great Plains to the gold regions of Montana. They came in wagons drawn by two or four horses, oxen or mules. Their sole object was to reach the gold camps. Once here, their horses and
wagons were of little further value. The rapid growth of the mining camps where neither food, clothing nor tools were produced, necessitated some system of transportation of supplies. The nearest railroad was hundreds of miles away. One means of transportation was by wagon trains. (See Note 1) An abundance of idle animals and wagons favored overland freighting to these camps. There remained but one problem, that of man power. Men did not want to give up the quest for gold for the prosaic business of freighting, unless freighting could promise satisfactory financial returns. The only way to increase the earning power of each man was to increase the amount of freight he could control over the trip, cheap horses and wagons being easily obtainable. So there developed the freighter of the pioneer days, a man who could control with uncanny ease his teams of from eight to sixteen animals over all kinds of trails and under every condition, the team pulling a string of two to four loaded wagons. This came about under conditions where there were cheap horses and outfits, a heavy demand for transportation, but a scarcity of man power.

Compare this to the condition of the Montana dry land farmer in recent years. Land and horses have been comparatively low priced and farm profits, on the whole, low per acre. (See Note 2) Wages for hired help have remained high, so if the farmer is to increase his year's labor income he must, as part of his farming scheme, spread his own labor over greater areas of this low priced land, through some form of low priced power, so as to be able to bring the total of his profits up to a reasonable figure. It is again a story of the need of increasing the value of a man's labor by the use of low priced animals and low priced land equipment.

So the conditions that are bringing about increased use of big teams on Montana dry land farms today are in many ways

Note 1—Wagon transportation was an early means of supplying the western mining camps, although in Montana water transportation up the Missouri river to Fort Benton was established at an early date and was for many years a most important source of communication with the east.

Note 2—Montana went through a period of severe drouth in her dry land areas from 1917 to 1921. During these years average yields were low, many farmers were forced out of the farming competition, and horses and equipment became comparatively low in price.
similar to conditions that brought about the use of big teams in pioneer freighting days. It is not through man’s desire to drive big teams that such a combination in favor of big teams has twice come to this state. The big team is a result, not a cause. Man adapts himself to his environment, and the growing interest in big teams on Montana’s dry lands today is but another move in the adaptation of the Montana dry land farmer to the conditions that he finds about him.

The Development of Big Team Farming

The first big teams of the pioneer days were driven on "stretcher hitches," which were nothing more or less than log chains with double-trees attached by means of crotch chains. These teams were "string teams," and were generally driven by means of a "jerk line," or single line from the driver’s seat to the lead pair of animals, the leaders being trained to obey the twitches of this line and the call of "gee" or "haw." (See Note 3). Some time after the gold rush days in California, and when agriculture was beginning to crowd upon the heels of a fading gold fever there, some ingenious freighter took his entire outfit from the freight wagon and hitched it to the plow, thus adapting the big freighting outfit for the first time to farming. It is believed that this took place in the Sacramento or San Joaquin valleys of California. It was not until 1892 that Schandoney invented his equalized hitch, where each animal in the team group is forced to pull its full share of the load. This invention made the combine harvester-thresher practical for farmers who had settled the Palouse and Big Bend countries of Washington, as well as for those who were farming on a big scale in California. The combine, in turn, affected the size of the farm unit, which now became two or more sections, and again caused the contrivance of seeding and tillage implements where the same big teams which were used on the combine could be used in preparing and seeding the land. The

Note 3—Where two animals are driven abreast, the left horse is the "near" horse and the right horse is the "off" horse. This comes from the old habit of sitting at the left hand side of the wagon in driving, or in leading from the left side. Freighters of the pioneer days guided their teams by means of a jerk-line and by using the commands "gee" (to the right) or "haw" (to the left).
total result was a “big team type of farming” that has for almost a generation been accepted practice in these districts. (See Note 4).

Certainly this big team type of farming is coming rapidly into many of Montana’s dry land districts. It is not definitely an accepted general practice today because this farming region is too new for the farmers to have finally agreed upon any definite “type” of farming. (See Note 5). Yet in spite of years of drouth and economic disturbance, there has been a decided swing toward larger teams until one can say with assurance today that the big team is to become a definite part of the type of farming which these men are working out.

This bulletin is the result of two years of study of the use of big teams in the dry land, or non-irrigated, farming districts of the northwest. The writer long ago urged the use of larger teams on Montana’s dry lands, and developments of the past two years have only increased our confidence in the big team as a profitable part of dry land farming plans. In order to aid those farmers who are interested in big teams, that they may take advantage of the experience of men who have long used big teams, this bulletin presents as much detailed information as it is possible to gather at this time.

Through the Extension Service of Montana State College we present this bulletin for what it really is,—a detailed collection of plain facts from practical farmers of the northwest. The individual Montana farmer cannot spend the time or money necessary to investigate personally the general subject of big team farming through the northwest, yet this information must be in his hands if he is to proceed without the failures and troubles that come with experimenting. So it falls to the natural duties of the Agricultural Extension Service of the State College to gather and present to him uncolored and unprejudiced facts

Note 4—In western Canada, in more recent years, big team farming along the same general plan has been developed by such men as E. C. Hallman of Acadia Valley, and C. S. Noble of the Noble Foundation, Noblesford, Alta.

Note 5—The Montana State College Extension Service in 1923 published a bulletin called “Dry Farming in the North Central Montana Triangle” and which discusses in detail the type of farming which seems to be developing in a successful way for that region.
which may guide him without misleading him.

This is what the writer has attempted to accomplish. And if from this bulletin the farmer is able to gain from the experience of other farmers the thing which will make his own farming more profitable, then the study has not been in vain. The bulletin is, then, directed to the practical Montana farmer for its final test in the laboratory of the Montana dry land farms.

Part I—Teams and Harness

TYPES OF BIG TEAMS

In this bulletin three types of teams will be mentioned, although only the first two will be dealt with at any length. They are: (See Fig. 1).

String Teams.
Bunch Teams.
Abreast Teams.

Some Big Team Terms

TEAM—The word team is hard to define properly, since it may mean two or more animals driven together. It is used to define the entire group of animals, and also used to define parts of that group. Thus a bunch team is composed of a lead team, wheel team and perhaps one or more swing teams.

WHEEL TEAM—The group of animals nearest the implement.

LEAD TEAM—Those animals directly in the lead of the team.

SWING TEAM—Any team between the lead and wheel teams. The swing teams are generally called “first swing team,” “second swing team,” etc., the numbering beginning with the first team ahead of the wheel team.

String Teams

The string team consists of pairs of animals hitched in line with the load. This is the type of team used by the freighter of the pioneer days, and the pairs of horses are usually hitched, by some kind of equalizer, onto a draft chain which passes down between them. Ten head of animals hitched to a three-bottom plow is standard equipment in the big team farming sections.
Fig. 1—The three common types of big teams; A—The string team, with animals driven two-abreast; B—The bunch team, with animals driven six-abreast; C—The abreast team with all animals pulling against a common bar.

There is an advantage in this type of team because of the added coolness to the animals in hot weather, and in the freedom of each animal while working. There is less danger from tramping on feet, especially in turning, and it makes hitching a more simple operation. Many believe that the further a team is away from the implement, the less will be its pulling power, but this is not
necessarily true if the proper angle of draft is maintained on the traces of all teams.

**Bunch Teams**

In this team the animals are driven more than two abreast. Often there are four or more animals abreast, the common twelve-horse team having three rows of animals four-abreast. As many as 36 horses (See Note 6) are often used in bunch teams on the combine. These big bunch teams, with properly arranged lines, buck straps, connecting chains and equalized hitches, may be driven as easily as a two-horse team.

**Abreast Teams**

This is where all animals are driven abreast, all pulling on one common bar or double-tree. The writer has seen 14 horses hitched abreast, all hitched by means of chains and double-trees to a telephone pole, which in turn was attached to the implement. This team is unwieldy and difficult to handle if too large. It is rarely seen with more than four animals abreast, except on drag-harrows and summer fallow slickers.

**TYPES OF HARNESS**

The farmer who drives only four horses is not greatly interested in methods for reducing the work and time of harnessing and hitching and their reverse operations. But the farmer who drives eight or more animals will be interested in short-cuts that will lessen the time required to harness and get the animals from the barn to the implement, and return. One of the commonest objections raised to the big team by the inexperienced farmer is that it “would take too much time to harness and handle.”

**The “Butt Chain” Harness**

Farmers of the big team sections of the west have devised a type of harness which combines lightness, simplicity and many time saving advantages. This type of harness is called the “butt chain harness” and gets its name from the type of short tug used. Other parts of the harness may vary but the butt chain tug is in

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Note 6—Bunch teams also are used frequently for drilling, duck-footing and similar operations.
use in practically all of these sections. No one distinct type of harness is demanded in big team farming, yet experience proves that certain arrangements of harness are a big advantage.

The standard big team butt chain harness, example of which is shown in Figure 2, is distinct both for the butt chain type of

Fig. 2—The Williams standard butt chain harness commonly used in big team sections of the northwest:

Traces—Two inches wide, 60 inches long, three-stitched and of three-ply leather. The butt chain is 30 inches long and connects to a trace dee with a swivel snap. The belly band is riveted to the trace. The hip strap support is riveted to the trace six inches from the trace dee.

Hames—Steel bound, bolt type, of selected quality. Hame fastener is used in place of the hame strap.

Belly band—Leather strap 36 inches long, two inches wide, fastened on the right side with a Conway loop. On the left side it connects to the trace loop by a bolt snap.

Hip strap—This strap, which extends from the trace carrier on the horse's rump to the dee end of the trace, is of leather, one and three-fourths inches wide and 42 inches long. It is sewed to the trace carrier ring at the upper end. The lower end attaches to the trace by a Conway loop and a bolt snap.

Crupper—One inch wide at the place where the buckle attaches. It attaches on one side by an ordinary buckle, but on the other side by a Hubbard crupper snap. It is of four-ply leather.

Back bands—This is the split back band type. The rear strap is 40 inches long, one and three-fourths inches wide and is stitched into the trace carrier ring. The second strap is 26 inches long and attaches to the hame ring by means of a Conway loop. The side ring is attached from the back band to the trace carrier loop by a heavily sewed strip four and one-half inches long.
traces and also for other labor saving arrangements, such as hip straps, tug supports, and snaps instead of buckles. The tugs on the butt chain harness, instead of extending from the hame to the single-tree, extend only to the horse’s thighs. The leather part of such a tug is usually 60 inches long, and the standard type of butt chain, which extends from this tug to the single-tree, is two feet and six inches in length.

The tug may be attached to the butt chain in several ways. However, the Dee fastener (See Figure 3) in which the butt chain is snapped, gives the best satisfaction. A harness equipped with tug Dees and butt chains with snaps may have a trace carrier attached to the harness on the horse’s rump and, when desired, the butt chains may be left snapped to the tug Dee and the end hooked up on the trace carrier when not in use. When so equipped, the butt chain harness serves for all practical purposes as a heel chain harness.

Sometimes a swivel snap (See Figure 3) is used instead of the simple Dee, the links of the butt chain being snapped into it. The objection to this is that the snap may easily get caught on objects with which it comes in contact. The old fashioned type

Fig. 3—The Dee fasteners; A—Tug dee with hook attached; B—Tug dee plain, the snap being part of the chain; C—Plain tug hook which sews into the end of the leather trace and to which the chain is attached; D—The tug dee which has a swivel snap attached and which is a commonly used type.
of butt chain harness attached the tug to the chain by means of a hook. (See Figure 3). However, the objection to the hook is the same as with the swivel snap, that it may get caught on the harness of another horse or on parts of an implement, and also because the butt chain itself can easily become unhooked. This is especially likely to take place while a team, hitched to a wagon, is going down hill with the tugs swinging loose.

Butt chains are of different types. The butt chain shown in Figure 4 is particularly recommended. (See Note 7) It is light, yet strong, having both a swivel and a well constructed snap. This type of harness is inconvenient only when the teamster changes to a new implement without transferring his equalized hitch, which is not likely to happen often.

Fig. 4—The recommended type of butt chain. It has a strong snap, a swivel and is light, yet strong. Thirty inches long.

Weights of Harness

In using the butt chain harness in big team outfits, the lines usually are left off most of the animals, although a buck strap may be used instead. They are accordingly much lighter than the ordinary farm harness. The average butt chain big team harness without lines, etc., but with buck straps attached, weighs from 20 to 24 pounds. The regular farm harness, with britching and lines, weighs in the neighborhood of 35 pounds, while a heavy dray or wagon harness often weighs 44 to 50 pounds. The lighter harness is a distinct advantage in harnessing.

The butt chain harness is much lighter than the ordinary harness and the short tugs do away with necessity of fastening up of the tugs at unhitching time when the driver would have to crowd in between the horses to hook them. The tugs are per-
Fig. 5—In unhitching the chain is unfastened and dropped. No tugs to hang up.

manently held up (See Figure 2) by hip straps so that in unhitching or hitching the only operation is in dropping or attaching the butt chain. (See Figure 5) There are, therefore, no tugs coming down to be stepped upon or to slap the horse’s legs.

Back Bands

Opinion differs about the back band of the harness. Some favor the regular back band, others the Concord type of split back band. Some men argue that with the regular back band the collar is held up against the top of the neck when the animal is eating from a low feed box, thus chafing the top of the neck. They hold that this is especially true when animals are fed from a nose bag. On the other hand, the regular back band probably fits the horse better and keeps its place better than the split back band.

The big team harness should have a strong crupper. In the model harness shown in Figure 2, the crupper is one inch in diameter, four-ply and made extra strong. It fastens with a Hubbard crupper snap (See Figure 14). It needs to be made strong and heavy for big team purposes because teams are handled in unit fashion. They are led out of barns, watered and led to implements with the animals tied to each other. If a horse is contrary and tends to pull sideways, this makes the strain come upon the back band and the crupper.
California Chain Harness

The chain trace harness is simple, cheap and adapted to big team work, but is not as handy as the butt chain harness. (See Figure 6). It is used frequently, however, especially by men who are starting farming and who want to keep their equipment to the lowest possible cost. Often the chain tugs are enclosed in a leather boot to prevent chafing the horse's side. The tugs may fasten to a hook in the hame or to a permanent staple.

Fig. 6—The chain trace harness is often used to cut expense in changing to big team operation.

Home Made Harness

Montana farmers who are planning to use larger teams often ask about home made harness, since the cost of harness is at times the thing that determines whether the change shall be made. The following types of home made harness are presented because they are of proven value. They combine the use of the butt chain with other labor saving devices.

The Gilchrist Harness

In the home made harness of Gilchrist and Sons of Scobey,
Fig. 7—Home made harness belonging to Gilchrist & Sons, Scobey, Mont. The rope passes from the hame back to the pulley single-tree, returns and extends to another horse in front. Note that by unhooking the rope at the hame the horse is almost unharnessed. A short rope from the hame and with a ring in its end holds up the lower rope so it will not be stepped upon in turning.

Montana, (See Figure 7) rope takes the place of traces and most of the regular harness is done away with. Three-quarter inch rope is used and the horses are hitched tandem to a pulley single-tree. Each rope is 22 feet long, three-fourths of an inch thick and has a ring fastened to each end. The belly band is a strap three feet in length, riveted to each trace rope at a point 18 inches back from the hame hook. No back band is used. To unhitch, the ropes are simply unhooked from the hame and dropped to the ground. It is noted that old fashioned “hook” hames are used. When the team is unhitched it is also almost unharnessed. With gentle horses, chain traces are often used with the above described type of hame and may be unhooked at the hame or at the single-tree, depending upon the practice of the teamster.

Hallman Home Made Belting Harness

This harness (See Figure 8) is made out of old standard 10-inch, five-ply, gandy thresher belting. The belting is cut in seven foot lengths. Each length is split into three strips, two of
these being used for tugs, the other for the back band. Mr. Hallman (See Note 8) purchases four-ply, three-inch gandy belt-

Note 8—Referring to Mr. E. C. Hallman of Acadia Valley, Alta., Canada, whose name appears on the title page of this bulletin as collaborating author.

Fig. 8—This Hallman homemade harness gives excellent service. It is made from old standard, 10-inch, five-ply, gandy thresher belting.

Fig. 9—The Hallman homemade cowhide harness is light, cheap and serviceable.
Prizes for Low Cost Production Needed

The dry lands of Montana give evidence of being regions in which medium yields may be expected. To make money with wheat, therefore, the farmers need to have enough acreage in wheat each year so that they have a large volume of wheat as a result of their labor, and the work must be done at a low cost. If the profit is five dollars per acre, the man with 100 acres will make $500 while the man with 500 acres will make $2500.

Mr. Noble, the farmer of southern Alberta who has been using 12-horse teams and farming 30 sections of land, says that in his opinion the dry lands of southern Alberta and northern Montana must be farmed effectively and efficiently, yet on a large scale in the economical raising of wheat. He states that the giving of prizes at expositions for the best exhibits of wheat is commendable, but that we also need competition in cost of production so farmers will work out methods whereby they lower costs through superior management.

Hallman Home Made Cowhide Harness

Mr. Hallman experimented during the spring working season of 1924 with the simple light cowhide harness shown in Figure 9. He took a cowhide which had dried and cured, (See Note 9) oiled it and, without removing the hair, cut from it a triangular piece which he attached firmly to a set of discarded hames. He used the same material for back band. Under the hames and cowhide collar he used a common sweat pad, thus making a collar-hame combination of "humane" style. He was careful to put the point of draft at its proper place. (See Note 10). The horses which worked with this light home made harness did not have sore shoulders at the end of spring work. Mr. Hallman thinks this is a good outfit.

Note 9—In the spring of 1925 green cowhides were selling in Montana for about six cents per pound.

Note 10—Farmers are cautioned to take care in the fitting of collars and, if necessary, consult a veterinarian or their county agent to be sure that the angle of draft is properly placed.
SNAPS

Snaps should be used as substitutes for buckles wherever possible on the big team harness. They are great time savers and take but one operation to attach, while with buckles the loose strap must be inserted through the buckle, the tongue of the buckle adjusted to the hole in the strap, and, if a neat job is to be done, the strap inserted through the guard loop below the buckle.

Where regular buckles are used on the harness, adjustment of the harness to fit the horse is usually made at the places where the harness is buckled together. But where snaps take the place of regular buckles, the Conway buckle (See Figure 10) provides a safe, quick means of adjustment. The Conway buckle adjusts a loop in the strap, the strap being loosened or tightened much as a tent rope is tightened by its looped rope. Figure 11 shows the
"Safety First" With Snaps

An experienced teamster says: "Be careful with snaps."

Snaps may become dangerous, especially where colts or green horses are being used in the teams. With some spring tongue snaps it is possible for the finger to be caught in the snap if the horse gives a sudden jerk, causing a serious injury. Experienced teamsters also say that a driver of big teams should never wear a finger ring, as snaps can be caught on a finger ring, causing severe injury.

Good types of snaps are shown in Figure 14. Note that the tongue in Figure 14-D and E is so constructed that it slides over the back part of the snap. The tongue fits into a countersunk place, or "set in," in the shank of the snap and is prevented from slipping sideways while closed.

Bolt snaps as shown in Figure 14-B and I are good in the summer but are apt to freeze shut in winter. This is not as serious an objection as one might imagine since the big team is used principally in summer time. The special merit of bolt snaps is safety, especially in connection with halter chains where, in case the horse should jerk, they could be drawn through the hand without danger of hooking into the flesh. They are more easily operated with one hand than are tongue snaps. It is also a secure type of snap and particularly well adapted to halter ties.

"Cold-shuts" are a kind of snap used frequently with passing
link halter chains. The portion which attaches to the chain is left open by the manufacturer so that it can be clamped down

Fig. 14—Types of snaps; A—The cold shut snap used on the ends of the tie chains by Mr. Hallman; B—Common bolt snap; C—Spring tongue snap; D—Sheath snap, showing countersunk sleeve to keep spring tongue from slipping sidewise; E—Front view of the same; F—Hubbard crupper snap; G—Snap made for clinching about the ends of cord lines; H—Spring snap with spring side turned in to prevent its catching on other parts of the harness; I—Double end bolt snap.
Extensive Farming is Not Poor Farming

Large power units are no evidence of slovenly work or slipshod methods. Poor farming may be done either with the large or small team. This bulletin should not lead any reader to believe that in the argument for big teams is any argument for "shotgun methods" of farming. Poor tillage and slipshod methods are always to be roundly condemned. Experience has shown that the farmer driving a 12-horse team on suitable land, pulling four plow bottoms over eleven or twelve acres per day, or two 10-foot tandem discs and three grain drills, can do just as good work as the man driving a sulky plow, four-horse disc or a seven-foot drill.

with a hammer without breaking. Such snaps are particularly adapted for use on passing link chain halter ties. In closing the cold-shut there is some danger of its crystallizing and breaking. Mr. Hallman, who is always working at least two colts in his twelve-horse team and who thus requires the safest and strongest equipment, puts the end of the cold-shut in a forge until it is about half heated. He then takes the cold-shut out and cools the spring by dipping it in water so that it will not be damaged by the heat, after which he puts it back into the forge, heats it to a red heat and then closes it. He thinks this is better than cold shutting, but care must be exercised to protect the spring. He also finds that the cold-shut end often breaks off. When this happens, he drills a quarter-inch hole in the remaining snap shank, then inserts a wire loop through the hole, in this way prolonging the life of the snap.

HALTER BRIDLES

Another essential part of the economical big team harness is the halter bridle. As the name signifies, this is a combination piece which is made much stronger than the ordinary bridle. It is put on the animal when it goes out to work in the morning and not removed until night, being used as a halter (with the bit removed) for noon feeding. There are two outstanding types of these bridles,—the California type and the Hallman type.

California or Harvester Halter Bridle

As the name signifies, this type of bridle comes from California where it was developed to meet large team needs. The bridle is built heavy enough that it will not be torn when used
in the stable. The “pigeon wing” blinder does not easily catch on objects. When taken off the horse’s head at night, it is not hung with the harness to the rear of the horse where extra steps would be required to put it, but is hung on a spike driven into the manger partition support, above and in front of the horse’s head.

For noon feeding in the barn the bridles are not taken off the horse’s heads. The bits are removed from the mouths by being unsnapped on one side. Often at time of noon feeding in the barn only one horse of each pair is tied to the manger. For specifications of this bridle see Figure 15.

The Hallman Halter Bridle

Horses which have been broken to work with open bridles, as well as some horses accustomed to work with blind bridles, can be driven by means of the Hallman combination halter bridle. Its advantage is that the halter always remains on the horse’s head, the bits being held in place by means of snaps. Another advantage of this halter bridle is that, in case a horse has a tender mouth, he may be “tied in” by means of the halter ring instead of the bit ring, or the halter chain may be run through the bit ring and snapped into
Fig. 16—The Hallman halter bridle; A—It becomes a halter when the bit is unhooked; B—The bit is placed in the horse’s mouth and snapped to the nose piece, making a bridle.

the halter ring, thus taking the force of heavy jerks away from the horse’s mouth.

If the bit be attached to both halter rings by means of bit snaps on either side, the pull on the lines comes in such a way that the horse, by opening his mouth, can shift the pull to the nose piece rather than to his mouth. It is for this reason that the strap is used on the left side. On the other hand, if two straps be used, too much freedom is allowed and the bit is pulled through the horse’s mouth.

This Hallman halter bridle is simply a well made regular halter, to which a bridle bit is attached in a special manner. The bit is fastened in the right side by means of a bit snap, tongue side in, (See Figure 16) which serves as a connection between the bit ring and right check ring of the halter. On the right side a light hame strap connects the bit ring to a strong snap which in turn attaches to the throat ring of the halter on the left side.

Mr. Hallman uses this halter bridle on green colts that are being broken, as well as upon older horses. Where teams are gentle and there is no danger of a runaway, some teamsters use the bit snaps on both sides of the halter bridle.
Bits

Large, straight-bar steel bits are best. Jointed bits are used only on hard mouthed horses. They do not stay in position as well and are severe on horses, since the horses in big teams, especially in tandem teams, are more or less tied together through their bit rings. Bits are a little harder on the mouths of horses in big teams than in a two-horse team, because there is more or less jerking in big teams. For this reason a thick bit will be easier on the mouth. In case a horse gets a tender mouth, the connecting chain may be passed through the chin piece of the halter, as well as through the bit ring.

Combination Halter Shank and Team Ties

Time is saved by using the halter tie for leading to the field and for “tying-in” the horses in field hitching. For this purpose, chains are better than ropes. The most popular chain is known as three-sixteenths inch “passing link” steel chain. This type of chain never tangles, is reasonably light, and is stronger than rope. With the rope halter shank, time is consumed in tying and untying, gets wet at the water trough, is apt to unravel and in other ways is not dependable. (See Figure 17). These chain ties are made about three feet long, with a cold-shut protected spring snap (or preferably a bolt snap) on each end. They often are used as halter ties in the barn, being slipped through the manger hole, or manger ring, and snapped back in the chain for

Natural Prejudice Against “Change”

There is a natural prejudice against change in any industry. The following extract is taken from the first report of the Illinois Agricultural Society proceedings, a speech at the Montgomery County Fair, on Sept. 28, 1854: “We are proverbially a fast people and our young folks are not willing to drive an ox team when horses are to be had. Perhaps they are right, and if they will always, as I hope they may, make a profitable use of the time saved by the more speedy gait of horses, their choice will be generally approved. There are, however, many kinds of farming operations where an ox team is altogether the best, to say nothing of the fact that the carcass of the old ox may go into the beef barrel, while that of the old horse is food only for crows.”
any length desired. They are also used to snap the horses together as they are led from the barn to the water trough and field, and again to tie the horses into position in the team in the field hitch. They are an essential part of the time saving equipment for the big team.

Some big team farmers use open throat canvas collars and permanently attach them to the hames, so that in harnessing and unharnessing the collar goes with the hame. Figure 18 shows how Mr. Hallman attaches an ordinary open throat canvas collar to the hame. This type of collar is said to be easy on the horse's shoulders provided it does not interfere with the windpipe. The objection is that it is not as endurable because the canvas wears
Fig. 18—Showing (left) an ordinary collar cut open at the throat and permanently attached to the hames; (right) an ordinary open throat canvas collar wired to the hames.

and tears. To correct this, Mr. Hallman covers the wearing parts with soft leather. He also cuts an ordinary leather collar open at the throat and sews the ends as shown in Figure 18. This collar is permanently attached by wire to the hames. It has been used with the best of satisfaction and saves labor at harnessing and unharnessing time. (See Note 11).

Hame Fasteners

The hame fastener is an important time saving feature in connection with the big team harness. Fasteners of the lever type may be adjusted at the beginning of the season when hames and collars are fitted to the horses, and will need no further adjustment. The ratchet type of fastener is also popular and recom-

Note 11—Dr. Howard Welch of Montana State College says that, from a veterinarian's viewpoint, there is no objection to this practice if the collar fits so as to place the point of draft properly, and if it does not slide enough on the shoulder to chafe the skin.
mended. These hame fasteners save much of the time that is ordinarily used in tightening hame straps during harnessing. They may be purchased from harness or hardware dealers. (See Figure 19).

**BARNs FOR BIG TEAMS**

In the districts where big team farming has long been common practice, the barns are generally built on a plan to make the handling of the team very simple. Good examples of barns for big teams are shown in Figure 20. Many farmers can make the handling of their big teams easier by a few simple changes in the barn arrangement.

It is well to have a wide space back of the horses. This insures ease in leading a big team out of and into the barn. The standard distance from the manger to the wall back of the horses

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Fig. 19—Hame fasteners of the lever and ratchet type. They save time for the big team operator in harnessing and unharnessing.

Fig. 20—Some big team barns of the type often found in the northwest.
is 18 feet. There should be sliding doors at both ends of the barn, eight feet being the minimum width and 10 or 12 feet the standard width, but the wider the better. The wide space and doors give plenty of room for the team to swing when being led out. It also permits a manure spreader to go through the barn for cleaning up manure. Where a manure spreader is not used, a homemade cart such as shown in Figure 21-D, and which uses old buggy wheels or rake wheels, will be found convenient for cleaning the barn. The Montana State College Agricultural Extension Service and its county agricultural agents will give suggestions to farmers who desire to remodel barns for big team use.

Mangers and Stalls

Mangers are usually 33 inches high, 30 inches wide and 24
inches deep, although these measurements may vary. For ordinary double horse stalls the width is eight feet. This width should be increased for large horses. Long partitions between stalls are not necessary. Horses and mules when handled in big teams get used to standing together in the barn. A small partition (See Figure 21-A and B) between the feed boxes will prevent most, if not all, of the fighting, but if some animals still fight in the barn, a pole can be put between them. Absence of the big partitions between teams saves many steps for the teamster while harnessing and unharnessing and allows the team to be swung easily for leading out of the barn. A stable without these regular partitions requires only from three to three and a half feet per horse.

A type of stall partition half the ordinary length is shown in Figure 21-E. While not as handy as the type described above it is fairly satisfactory and found in a number of big team barns.

The length of the barn will depend upon the size of the big team and the manner of stabling the animals.

Herbert Hallman, brother of E. C. Hallman who has been mentioned before in this bulletin, converted a machine shed into a barn when his big barn burned down, by taking out the implements and building a manger along the center. He can drive six-horse teams abreast through the doors and into the barn for unhitching and unharnessing. (See Note 12).

Another convenience in tying horses to the manger is shown in Figure 21-C. It saves the trouble of running the halter tie chain through a hole in the manger. A ring is permanently attached to the manger by an eye bolt. The halter chain in run through this ring and snapped back into some link at a point that will give it the proper length.

Note 12—Herbert Hallman, brother of E. C. Hallman, harnesses his horses and connects them together in the barn. Although not common practice, he says he finds it most satisfactory under his conditions.
Part II. From the Barn to the Field

HARNESSING THE TEAMS

Currying and Brushing

During the early spring while horses and mules are shedding, heavy and thorough currying and brushing are desirable. Many operators provide a large barn lot where the animals are turned loose at night as soon as the warm weather begins. This gives them an opportunity to roll, the rolling serving as a substitute for currying during this season of the year. Figure 22 shows a type of combination brush which is popular in big team districts.

Fig. 22—A combination type of curry brush popular in the big team districts.

The bristles in the center of the brush are made of flexible wire, while those on the outside are of a stiff vegetable fibre.

It is absolutely essential that great care be exercised over the shoulders of working animals. Most, if not all, shoulder trouble can be avoided by proper fitting of collars and by care of the shoulders. The mane should be trimmed enough that it will not mat under the collar. (See Note 13).

Note 13—There are available a number of articles on the fitting of hames and collars. If interested, ask your county agent.
Speed In Harnessing

All possible saving of time should be made in harnessing the team. Many men who all their lives have been accustomed to four-horse teams with wagon harnesses naturally are of the opinion that so much time is consumed in harnessing and hitching a large team that this time element makes the big team impracticable. Doubtless there would be much truth in this were it not for the short cuts which have been discussed above under the subject of harness.

Lloyd Talkington who, with his brother, farms two and one-half sections of wheat land near Harrington, Washington, harnesses a mule in thirty seconds. These accompanying pictures and descriptions show how he handles harness from the peg to the animal's back. Here are the steps described from pictures in Figure 23.

The harness should always be hung on a peg high enough that it can be placed with "one hanging" and high enough that the ends of the butt chain tugs will not touch the ground. The upper hame strap only is placed over the peg. This saves an extra motion in hanging the harness. (Figure 23-A).

First step: Always handle the collar with two hands, to prevent breaking at the throat. (Figure 23-B).

Second step: Collar is placed over the teamster's left shoulder (Figure 23-C).

Third step: Sliding the back band, which was not hung over the peg, over the right arm, both hands on the hames, collar on the shoulder. (Figure 23-D).

Fourth step: Walking towards the animal, harness in position ready for throwing over back. (Better say "whoa"). (Figure 23-E).

Fifth step: Throwing harness, adjusting the hames. (Figure 23-F).

Sixth step: Then the back band and tugs.

Seventh step: Putting on collar and holding each side of the collar, thus preventing breaking in the middle. While buckling, the collar is held in place by the teamster's shoulders, the right and left hand adjusting the buckle. (Figure 23-G).

Eighth step: Hames in position. (Figure 23-H).
Fig. 23—“Shorty” Talkington harnessing one of his mules. Description of each step will be found in the accompanying text.
Fig. 24—A—Collar broken by careless handling; B—The wrong way to handle a collar.

Ninth step: Fastening hames with patent lever hame fastener. Much quicker than using the hame straps. (Figure 23-I).

Tenth step: Snapping the belly band and crupper. Takes less time than buckling. (Figure 23-J).

LEADING THE TEAM

The big team is led out of the barn, watered and led to the implement as a unit. With a trained team and an experienced teamster this causes no more worry than the leading of a two-horse team from the average barn.

Halter bridles, when not in use, are not hung with the harness to the rear of a team where they would require a trip to the rear of each team when bridling and unbridling. Instead, a heavy spike is driven on the upright partition between the feed boxes just as high as a man can comfortably reach. Thus in bridling, the teamster passes in front of the horses, connecting the horses together as each is bridled. The driver begins putting on halter bridles on the right or off horse of the rear or last pair. The halter tie-chain may be left permanently attached to the halter bridle, in which case the regular stall halter is simply dropped in the feed box. Other teamsters use only one chain, unsnapping it from the halter and resnapping it to the chin snap of the halter bridle after which it is unsnapped from the manger and arranged in the proper manner for leading or tying a team together.
Fig. 25—Getting the team ready to lead from the barn. Note that the off horse of each team is tied to his mate, but that each near horse is tied by his lead chain to the tug of the near horse of the team ahead. The teamster leads out the near horse of the first (right hand) team and the others follow in pairs.

The tying of the teams together in the barn, at bridling time, is simple but important. To fasten the pairs of animals together so they may be led from the barn to the water trough and to the field, the teamster starts with the animals of the rear pair. The halter chain of the near horse is snapped to the Dee in the end of the tug of the near horse of the next pair. Note that when animals are strung out to lead, each near horse will be snapped to the near horse in front of him. To tie them together this way in the barn the halter chain of the near horse must be passed in front of the off horse to be snapped to the tug of the next near horse. Reference to Figure 25 will help to clear up this process of tying together in the barn. The process is repeated down the string of animals until the teamster reaches the lead pair. By leading these out of the barn the others follow naturally in pairs. It may be noted that this method of tying together in the barn is simplified by having short stall partitions. Where there are long partitions the animals must be backed up to make the halter chains reach to the tug Dees. The off horse in each pair is snapped to the hame of his mate. A few days will teach a green team to swing and lead easily. The animals will file up to a trough to drink and turn to the same position in which they stood in the barn.
If the right horse of the second team is chained to the left horse of the first team, it gives more room in swinging out of the barn in watering, but allows the team to scatter sideways in leading from the front team. Leading as outlined above gives the teamster much better control. Large team barns usually have big doors at both ends of the barn so if the driver always leads the left hand horse of the first pair and always swings to the right, he will thus lead out of one door and in at the opposite door.

**Watering**

Long water troughs where the entire team can drink at one time are recommended. (See Figure 27). The same results can be obtained from a large round tank. Bits are not put into the horses' mouths until after they have finished drinking. Many teamsters do not snap in the bits until they have led the team to the implement. It is good practice to leave the bits in the
Horse Breeding Looks More Favorable Now

The marked falling of horse prices in recent years indicates a slackening in horse breeding which cannot long continue without a scarcity of horses and resulting high prices. Dr. G. F. Warren says that "there are very strong cycles of under and over-production of horses. The period of rising and of falling prices usually lasts 10 to 15 years."

In the Montana Extension Service Bulletin "Montana's Agricultural Outlook for 1925" farmers are advised to raise as many horses as they will need to provide and replace their farm power, with perhaps a few extra for market, since horse prices look more favorable for the future. Only good animals of draft type should be bred.

mouth when the team is first watered at noon that they may drink slowly and therefore be in no danger of water founder. Most drivers do not unsnap the tie chains at the noon watering when they come in from the field. However, other drivers unsnap the entire team as soon as it reaches the barn yard, letting horses go and drink as they please and training them to go to their proper places in the barn. This last method is not generally favored.

Hitching Corrals

Some farmers in Montana who are not accustomed to western methods have built a small corral in the same barn yard where the watering trough is located. Instead of leading the horses out in the manner described above, each horse is bridled and allowed to walk out of the stable into the yard, where it drinks. After each horse has taken its water, the driver begins grouping them in their proper positions in the hitching corral, which is the same width as the team when hitched. He takes down the lines, ties the animals together and drives them to the field in the same manner in which they are worked. (See Figure 28). While this method is not recommended, yet it is workable, although not economical as to time. However, some farmers who work twelve-horse teams with the Hallman system and who are not equipped to drive assembled teams in and out of the stable might find hitching corrals a convenience.
Fig. 28—Some teamsters assemble their animals in the barn corral, having the corral just the right size for grouping the animals. This drawing shows how the animals are harnessed in the barn and turned loose to go to the watering tank. From the tank he takes his lead animals and places them at the front of the corral, tying them together, then brings up the next pair, etc. When all the animals of the team are assembled and tied-in, he unfastens the gate and drives the assembled team to the implement. The method is workable, but it is not generally recommended. It is used by some farmers who do not have a barn which allows the team to be led in and out easily.
Leading to Implement in Hitching

The driver usually leads the big team to the implement in the same arrangement as they come out of the barn. If he is driving a bunch team of twelve he will therefore have six pairs, one pair following another (See Figure 29). Some, however, break the team up in the barnyard after watering, snapping one string of three pairs to the other three pairs and leading them in this manner to the implement. It is more common, however, to lead them as a string of pairs, stopping the first pair at its proper position with reference to the single-trees at the implement, then leading the second string into its proper position.

Usually the teamster begins by hitching the lead animals. He arranges the lines first, then ties the horses together. After hooking the tugs of the leaders he ties in and bucks back and then hooks the tugs of the other pairs.

LINES

Large teams driven with equalized hitches and buck straps are always under perfect control. Tying in and bucking back with all horses except the leaders take the place of control through the lines. Usually, when buck straps are used, only the lead team is driven with lines and the rest are controlled through their buck and tie straps.

Where four are driven abreast, the line and check arrangement for the center pair of the leaders is just as it would be if the driver were driving only two horses. However, when working four leaders, the regular leather lines of the center pair of animals are cut off about two or three feet back of the buckle that attaches the inside check to the main portion of the line. A snap then is
(Fig. 30—Description at top of next page)
Fig. 30—The line arrangement is important in the big team. A—The line arrangement of a lead team of 12 horses. Note the cord line with the ring in the end (arrow), and the outside and inside checks snapped into this ring. The ordinary line is cut off 18 inches back of the buckle which connects the outside check of the ordinary harness. A buckle is sewed to this end, which in turn snaps to the ring in the cord line. A regular check goes to the outside bit ring of each outside horse, and this is, likewise, snapped to the ring in the end of the sash cord line; B—Unsnapping the spreader snap from the bridle at unhitching time. Note that the spreader strap is snapped to the bridle so that a swing or wheel-horse cannot get his head over the rope line. In unhitching, the spreader straps are unsnapped and the cord lines dropped to the ground between the center teams; C—Looking down the center, between the teams, showing the line arrangement; D—When the outside check is unsnapped from the cord line in unhitching, it is snapped to the harness; E—The rope lines are coiled and left at the implement; F—The cord lines end a few feet ahead of the driver, leather lines being snapped to their ends so the driver may have leather lines in his hands. (See Figure 30-A). The outside horses of the lead team are guided by regular leather check lines which come over the backs of the inside pair of horses and end in snaps.

Cord lines that reach back to the driver have rings in the ends, into which these check lines are snapped on each side, the snaps for both inside and outside animals being attached on the same ring. (See Figure 30-E). In buying cord lines, 10 feet is allowed for each team. To the ends of the cord lines may be attached clinch cord line snaps. (See Figure 14-F) or one inch or one and one-fourth inch rings. If snaps are used, the clinch snap gives a much smoother job than is obtained by bending the cord around and tying it with harness thread. However, the disadvantage in snaps is that they sometimes catch when being drawn through the spreader or hame rings at unhitching time. Cord lines also are very hard on the driver’s hands. For that reason it is well to snap those portions of the regular leather lines which have been cut off as above noted, into the ends of the cord lines to give to the driver leather lines to hold in his hands. (See Figure 30-E).

If the driver sits on a high crows-nest, (See Note 14) he will not need spreader rings, as the lines will carry above the

Note 14—The term “crow’s nest” is used by big team farmers to mean a driver’s seat which is raised high enough above the implement to give the driver a full view of the team and to raise him above the dust. Different types of crow’s nests are discussed and illustrated in the text of this bulletin.
Cheap Horses are Available in Montana

Under present conditions there are plenty of cheap horses available in Montana. Horse feed can be raised without seriously interfering with the dry farm cropping system. Farm management studies have shown that men, by farming with large horse outfits, have done well in the dry land districts. Here is an illustration from the "Triangle" farm survey of 1922:

"On farm No. 235, Chouteau county, the average yield of wheat in 1922 was eight bushels per acre, yet this farmer made a labor income of $2063. He had 500 acres of wheat, part winter and part spring wheat. He summer fallowed 200 acres. He did all of the work except heading and threshing by himself with his 14-horse team. His total current expenses for the year were $1107, which included $270 for harvesting and threshing labor and board. His total receipts were $4180 and total expenses were $1257, which included depreciation on his farm machinery. He had an investment of $14,350 which, at six per cent, makes an interest charge of $861. His taxes were $200."

horses' head. However, if he is not elevated, it will be necessary to run the extension lines through spreader rings attached to the center animals of the wheel and swing teams. If spreader straps with rings in them are used, they may be snapped to the upper side ring of the halter bridle. Then the line is supported in such a manner that a horse cannot get his head over it. (See Figure 30-B).

In unhitching bunch teams, the cord lines usually are dropped between the center pairs. In the case of string teams, they may be withdrawn and coiled up back of the team. (See Figure 30-F). The ends of the checks and lines are snapped or fastened to some rear part of the harness. (See Figure 30-D).

The two outside horses, where there are four leaders in a bunch team, may be tied to their inside mates in several different ways. The connecting chain may go from bit to bit, the objection to this being that it is hard on the horses’ mouths. Or it is better for the chain to go from the chin strap ring of the halter bridle, to the bit ring of the outside horse. The objection to running the connecting chain from the hame ring of the inside horse to the bit ring of the outside horse is that it is hard on the outside
horse's mouth, and makes it more difficult to control the team on a turn. The arrangement is not important and depends primarily on the docility of the horses.

**Bucking Back**

By bucking back is meant tying a horse to some part of an equalized hitch in such a way as to make possible two results:

(a) If the horse gets too far ahead it pulls him back just
as the driver would do if he had a two-horse team with lines.

(b) It gives control of the entire team through the leaders. When the leaders stop (under control of the driver's lines) the equalizer and single-trees slacken to the ground. In so doing, they pull back on the horses of each team through the buck straps, just as would be the case if the driver were checking them with lines. Likewise the rear pairs cannot start until the leaders start and raise the draft chains and slacken the buck straps, thus relieving the pull of the buck strap on the rear teams. If

Fig. 32—This is the Schandoney hitch "turned loose." The animals crowd each other and do not utilize the lever advantage of the hitch. The improper way to use this hitch. Buck straps should be used.
the driver bucks back his teams correctly, he has perfect control of the entire team. Most good teamsters use buck straps on all horses except those in the leaders. (See Figure 31).

Buck straps make it impossible for a horse to get ahead of his proper position in relation to the draft chain. A team can not run away as long as the leaders are under control and when standing, it is impossible for the team to start until the leaders start.

Kinds and Ways of Using Buck Strap

Regular Leather Crotch Rein Buck Straps—(See Figure 33). This is the best type and the one used in California, Oregon, and Washington with 32-horse combine harvester teams. The checks, which have bolt snaps at the ends, are adjustable by means of a Conway loop so that in case a horse has a tendency to throw its head or to walk sideways, it can be corrected. The long part of the buck strap, or the part running from the check ring to the draft chain, is also adjustable according to the length of the horse and the tug. The snap at the end may be attached to the

Fig. 33—The buck strap, with dimensions given. Note the Conway buckles and loops which allow quick adjustment of each strap.
draft chain in the case of a horse working next to the chain. (See Figure 34). The buck straps of the outside horses in single chain equalizers usually are snapped into the single-tree of the horse next between them and the draft chain of the equalizer. Buck straps usually are adjusted so that they slightly loosen when the horse is in proper position, but tighten after the single-tree drops to the ground when the horse stops. This is the recommended method and the one in use on most big team farms. The two checks which extend from the ring in the end of the heavy strap to the bridle bits also are adjustable, and can be adjusted to make the animal walk straight if it tends to crowd. In unhitching, teamsters snap the rear end of the buck strap upon the hip portion of the harness at that point where regular tugs are usually fastened, and the bit snap to the hame line rings. The buck strap should be run through the hip strap loop, as shown in Figure 34 which prevents the horse from stepping upon or over the buck strap and causing a bad disturbance in the team.
BUCKING FROM BRIDLE BY MEANS OF THE SCHMEISER CLAMP — In bucking in this manner the regular bridle rein often is used, in which case it is usually lengthened out. To it is attached a clamp containing an eye. (See Figure 35). This clamp may be placed upon the regular bridle check rein so as to adjust the pull on either side. A rope, chain or strap is snapped to this eye and passes through the hip strap loop to some part of the equalizer or single-tree of the next horse. (See Figure 36).

Some teamsters, instead of using a halter rein, use a rope about 10 feet long with snaps in both ends which attach to the bits, and a rope halter tie eye-clamp in the center as described above. Other teamsters may use the same principle, but instead of using a clamp an ordinary loose ring is used, thus making the rein entirely flexible. With such outfits, the buck rope or chain is usually unsnapped from the check when unhitching.

BUCKING FROM CHIN STRAP OF HALTER BRIDLE — This is a makeshift method but may be used at times. It is more frequently used with string teams than with bunched teams. If used with a bunch team, the fast horses are put next to the draft chain. An ordinary halter tie extends from the chin strap to the draft chain. When the horse tries to get too far ahead, it therefore has a tendency to pull him back and to pull his head down towards the chain. The farther back on the draft chain he can be bucked in this manner the better. As it will tend to put his head down, a check rein will have to be put on. To buck back
a horse which is not next to the chain, tie him to the back band of his mate which, we assume, was bucked back to the chain and which keeps his proper position. Then run a jockey stick (See Note 15) from his bit ring to the hame of his mate.

**Tying-In**

By tying-in is meant fastening the halter lead chain of one horse to the single-tree of the horse in front. This prevents the horse from loafing back, the same as the buck strap prevents him from working too far ahead. It also steadies the team and prevents spreading. However, it is not as important as bucking.

**Fig. 37—Tying-in by (A) the straight tie and (B) the cross tie.**

Horses should be tied according to the way they work rather than on the principle of leading. If, for example, one horse tends to crowd another, he should be tied to prevent this. Sometimes they are tied straight ahead to the single-tree, (See Figure 37-A)

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**Note 15—Drivers of big teams often tie the lead animals together by means of a light wooden bar called a jockey stick. It is a light bar just long enough to keep the animals the proper distance apart, and is attached by snaps from the bridle bit to the hame ring of the next horse.**
and at other times by a cross tie. (See Figure 37-B). Those who cross tie argue that it helps in handling the team in turning and, furthermore, that it keeps the team from spreading.

**Big Team Whips**

A long whip of the fish pole type is not adapted to big team usage. In the first place, with string teams it would take a whip 50 feet long to reach the leaders. Secondly, the sound of the whip causes confusion among the whole team. It is customary to use small pebbles instead of a whip. A good driver becomes expert at throwing pebbles. He keeps a little box of pebbles handy on his crow's-nest seat.

E. C. Hallman, who uses halter bridles without blinders on his twelve-horse tandem teams, uses a boy’s repeating air rifle in which the pressure has been reduced. (See Figure 38). The effect is excellent if the aim is true and if the pressure of air is enough to sting without raising a welt on the horse.

**FIELD FEEDING**

E. C. Hallman, who drives a twelve-horse team in six abreast

![Fig. 38—Mr. Hallman uses an air rifle, in which the compression has been reduced, instead of a whip for big team use.](image-url)
Fig. 39—A model of the Hallman field feed rack, with dimensions given.

tandem fashion, has devised a unique field feeding rack. The following description has been prepared by Mr. Hallman.

"It has generally been supposed that an eight-horse team is about the maximum size that is practicable for a man to drive in farming operations, but by the use of a new feeding rack, we have found it quite feasible to use larger outfits. This feeding rack renders it unnecessary to unhitch a single tug for noon feeding. The rack is built on skids so that it may be moved freely about the field. By merely hooking it to the back of the field implement by log chains, it may be drawn from place to place as convenience suggests. The troughs in the rack are lined with metal for watering and are fitted with plugs for draining. Water and oats are brought to the field about once a week. Both the water tank and oat box are mounted on the same wagon. (See Figure 40).

"Operations at noon are as follows: I drive to the feeding rack, which stands with the rear trough withdrawn and gate swung open. I close the gate, insert the rear trough over a roller between the lead and wheel teams, then hook the free end of the
Montana Weather Favors the Big Team

The Plains district of Montana, and to which this bulletin normally applies, has a large percentage of working days during the tillage season. This means that in the normal year the big team can work much of the time. Farmers from the humid regions know that frequently there are years in which they are kept from tillage operations because of wet weather. There are but few seasons in Montana when the big team cannot be worked 75 per cent of the time. This is an important element in our dry land farming and is one of the factors helping big teams.

trough to the gate. Turn the water hose into the troughs.

"After the horses have had their noon drink, the troughs are drained of the surplus water, and the feed oats thrown in. The horses will have finished feeding by the time the driver has had lunch and oiled the implement.

"To get the team out of the feeding rack, the operations are as follows: First, withdraw the rear trough, which rests on a roller made from an old binder roller, swing the gate open, turn sharply to the left and simply drive out to work. All of this requires less than an hour, saving the time of unhitching and walking to and from the stable, separating and tying the horses in stalls, reassembling and hitching. Sufficient time is saved at noon to fully compensate for the extra work in handling the large outfit as compared with the unhitching of a smaller team at noon. The rack may also be used to good advantage in hitching in the morning, especially when driving wild or unbroken horses. By swinging the gate to a closed position, the team is practically corralled until ready to start. We are almost continually breaking fresh colts and driving green unbroken ones and find this method of hitching and driving satisfactory. After the team is once lined up to their work, the rear lines are hung on the implement and only one pair of lead lines is used. Those who have never driven such an outfit will be surprised at the ease with which it can be handled."
(Fig. 40—Description at top of next page)
Mr. Hallman's field feed rack in operation; A—When the team has been driven into the rack, a trough is pushed through ahead of the rear team, the trough for the front team being always in place on the front of the rack; B—Water is taken from the tank wagon to the trough by a hose; C—View in front of the feed rack, showing the trough which is used for watering and feeding the front team; also shows the feed box on the tank wagon; D—While the team is feeding, Mr. Hallman eats his lunch and oils the implement; E—to get back to work in the field, the side gate is swung out, the team is sharply turned to the left and into the field; F—The feed rack and tank wagon are easily pulled to a new location behind the implement.

Other Systems of Field Feeding

Where fields are a considerable distance from barns, some men take a feed rack like that shown in Figure 41-A to the field and water and feed in it. This one was used on the Noble Foundation in Alberta and accommodates two twelve-horse teams, the teams of course being unhitched. Figure 41-B shows one of six portable feed boxes used for noon feeding without unhitching in connection with the Horse Association hitch. In the Pacific Northwest big team country the horses are always unhitched and fed in the barn at noon.

Fig. 41—Other systems of field feeding; A—a field feeding rack used in some sections; B—one of a set of portable feed boxes used by another teamster for field feeding.
Part III—Team Equalizing Hitches

It has been pointed out that big teams were not practical until the time of the invention of equalized hitches, by which a large number of animals of different temperament may be driven together. Prior to the invention of equalized hitches some horse often would lunge ahead when the team was started, trying to pull the whole load himself. Unable to do this, he would fly back and give up. This was especially true of colts and balky horses. Equalized hitches have great flexibility and, provided the team is properly bucked back and tied in, distribute the load equally to the shoulders of all the horses, thus making for perfect teamwork no matter how large the team may be. It becomes, therefore, impossible for lazy horses to shirk, or for energetic horses to pull more than their share.

This team work is especially necessary when a team starts the load. Perfectly constructed equalized hitches throw the load in a spring-like manner on the shoulders of all, even if a given horse does not start the minute that the leaders start. The pressure comes in an easy manner to his shoulders just the same as though he were pulling. It would be impossible to drive combine harvester teams of 24 to 36 head with two lines were it not for the equalized hitch. Experienced drivers also state that as soon as teams become accustomed to working in an equalized hitch but very little disturbance occurs in the team.

HORIZONTAL LEVER EQUALIZED HITCHES

This is the type recommended for bunch teams which are driven other than in tandem fashion. They give the most perfect equalization, each horse working upon an individual lever against the remainder of the team.

Schandoney Equalizing Hitch

This is the original of the patented large team equalized hitches. It was patented by Peter Schandoney of Sacramento, Calif., in 1892. Mr. Schandoney was a farm boy who, in driving a ten-mule string plow team in the Sacramento Valley of Cali-
BIG TEAMS IN MONTANA

Fig. 42—The Schandoney equalized hitch, from a model.

California, observed that in the hitch then used (which was a rigid stretcher hitch and was constructed by attaching an ordinary two-horse double-tree rigidly at regular intervals to a long log chain) that the lazy horses were practically free, thus making a dead load on the more energetic horses. He worked out an equalizer to make the slow horses pull their share of the load. From the time of Schandoney’s invention, his hitch has been the important hitch both for string and bunch teams. Its details are shown in Figure 42 and it is sometimes called the single draft chain hitch, there being only one draft chain in the hitch. Its advantages are its thorough equalization and simplicity. Its disadvantages are that it cannot be converted easily from a bunch team to a string team hitch. Until the advent of the Talkington patents it was the standard equipment for combine harvester and bunch team work in the western part of the United States. It is now manufactured by the Schmeizer Manufacturing Company of Davis, California, and can be secured through dealers.

Talkington Equalized Hitch

The Talkington hitch was invented by a farmer of near Harrington, Washington, who came from a family that has ob-
tained considerable notice because of ability to farm with large teams. The hitch is very popular in the Big Bend section of Washington. The advantages claimed for it are flexibility, simplicity and lightness. By changing the length of equalizer bars, it can be used either as a string or a bunch team hitch. It is manufactured by the Diamond Carriage Company of Spokane, Washington, and can be purchased through implement and hardware dealers. (See Figure 43).

**Home Made Equalized Hitch of the Horse Association of America**

While the above two hitches are regularly manufactured, this Horse Association hitch can be made in the farm shop or by the local blacksmith. The detailed drawing, (See Figure 44) shows the principles and specifications of the hitch, which are supplied by the Horse Association of America, Union Stock Yards, Chicago.

"Construction details: All eveners shown and which have to withstand the full pull should be of 2 x 10 or 2 x 12 material. The short eveners in tandem hitches that withstand a pull of four or six horses should be 2 x 8. The smaller eveners should all be made of the best hickory. Where this hickory cannot be obtained, other material such as oak or ash is used, but is more liable to give way under a heavy pull. A heart-shaped ring should be made from five-eighths inch round iron rods and should follow the diagram as to shape and dimensions in the center. The distance between the eveners, adjusted by the length of a log chain, should be no more than just enough to permit the horses to walk without stepping on the evener in front of them. It will be found that they can touch their noses to the tails of horses ahead and still not interfere with the eveners.
At the turns the eveners and chains may drag on the ground, but the horses soon learn to avoid the eveners, draw-chains and single-trees, or they may be held up as shown in Figure 45. However, the records of farms where these hitches have long usage show that this is not a source of accident or injury for the animals."

These specifications are those which were used on the Noble farm at Nobleford, Alberta. This Horse Association hitch is sometimes spoken of as the double chain hitch.
hitch because the 12-horse hitch consists of two six-horse string teams placed side by side. By changing the length of the equalizer bars a string team equalizer of any length may be made.

While hickory is the best wood for making equalizers, it is very difficult to get and the ordinary farmer often has to make a choice between oak and red fir. While red fir is tough it slivers badly. This can be partly prevented by binding the equalizer parts with strap iron. Equalizer bars are not so apt to break as one might think because the tension of the entire equalizer is like a spring. The advantage of this hitch is that any

Fig. 45—Draw chains held up by chains from the hames prevent horses from stepping over them in turning.

Fig. 46—The bars at the right are locked but those at the left are so bound with iron that they cannot be locked, thus assuring an even pull.
number of horses can be worked by changing the length of the different equalizer bars.

In making the hitch, especially the rear levers, it is important that the holes of the equalizer bars be in a straight line. If they are badly out of line, as is possible when heavy sticks are used as equalizer bars, a horse may step slightly ahead and therefore lock his bar so that he will have practically nothing to pull. (See Figure 46). This can be overcome by binding equalizer bars with iron and by making the points of bearing in line.

**Home Made Vertical Bar Equalizers**

This is a very simple type of hitch. The individual teams are attached to vertical iron bars adjusted to give the proper leverage to each team. They are frequently used in a 12-horse team consisting of three lines, four abreast. Figure 47 illustrates this principle. Rods instead of chains frequently are used to connect the parts. The advantage of the hitch is in its simplicity and cheapness. The ordinary four-horse double-trees, which most farmers have, can be used.

![Vertical Eveners Diagram](image)

**Fig. 47—A drawing showing the plan of the vertical bar eveners.**

The objections are, first, that the iron bolts of the clevises which attach to the bars cut out rapidly. Second, because of the short lengths of the vertical bars, it is easy for one team to get too far ahead and the other too far behind, thus tending to bring the bar to a horizontal position whereby the equalization is lost.

Buck straps do not work so well with ordinary four-horse
There is too much distance from the draft chain to the outside horse for smooth big team work if four or more horses are driven abreast on one evener. In the case of being used as a plow hitch, and where the wheel team is pulling on the upper two-thirds of the vertical bar, the wheel tugs are elevated so high that it gives the incorrect angle of draft. While serviceable to a degree, and fairly satisfactory in the hands of a careful driver, this equalizer is the poorest of the kinds described and is not generally recommended.

Block and Tackle Equalizers

These equalizers consist of a set of block and tackle pulleys. (See Figure 48). Any number may be used, provided the combination is such that each team in the series has the proper leverage against the teams ahead. The lead team and the team immediately following it work against each other, while the teams back of them work on blocks and tackle, giving them leverage of three to one, four to one, etc., against the horses ahead. They are well adapted to string teams if the teams are worked two abreast or four abreast. However, the objection to the wide single-tree also holds here. These hitches have flexibility, are simple and have had rather wide and successful use. Iron rods are often substituted for chains in those parts which do not work.
over the pulleys. Hardware merchants can furnish light, strong chains and pulleys with creases in the center of the pulley wheel so that the chain will fit the pulley and not have a tendency to cut the wearing parts.

The Schandoney Pulley Combination

A very good combination is shown in Figure 49, in which case a Schandoney unit is used next to the plow, the horizontal bars having a lever ratio of three to one in favor of the rear team. This prevents elevation of the traces of this team above their proper angle of draft, as was a fault in the vertical bar hitch. A chain or rod passes from the clover leaf, or heart, of this unit to a single pulley in front of the wheel team. The lead and swing teams work equally against each other over this pulley.

Tandem Chain and Pulley Single-Tree

These equalizers are simple. They consist of strong single-trees, which must be either exceptionally strong or, if ordinary size, may be reinforced with a truss rod. At each end of the single-tree a pulley is attached. It may be clamped by some
patented device, or an ordinary chain pulley may be hooked into the clip of the single-tree. (See Figure 50). A special short link chain, 10 feet and three inches in length, (including hooks) and of three-eighths inch in size, is passed through this pulley, the hooks at either end of this chain being attached to the traces of the two horses which stand one behind the other. Thus the two horses work against each other on one single-tree and are equalized in the team by various kinds of double - trees. Each chain should have a ring welded into it about 29 inches from the rear end to prevent the rear horse from getting too far ahead. A hanger chain and hook which holds up the draft chain at the rear horse's shoulder, is conveniently made about 20 inches over all, of three - sixteenths inch size passing link chain. To one end of this hanger chain is attached a narrow hook three and one-half inches long and into the other end is welded a five-sixteenths inch steel ring of such size as to allow the free play of the draft chain through it but not large enough to be slipped off over the draft hooks. The hook of the hanger is attached to the
Fig. 52—Mr. Hallman's chain and pulley outfit. Note the ring in the chain just ahead of the single-tree, making it impossible for the rear horse to get too far ahead.

hame ring of the horse to the rear as shown in Figure 51. This prevents the rear horse from stepping over or upon these tug chains.

The advantage of this equipment is in its simplicity and easy use with ordinary harness. It is used by E. C. Hallman in his twelve-horse outfit and works well in any tandem team. (See Figure 52). Buck straps are not used with such a team. The chief objection is that the size of the team is limited to twice the number which can be driven abreast and this, in the case of plowing, may put some of the horses on the plowed land. It is especially adapted for use with duck-foot cultivators. Another objection is that the angle of draft of the front horse may be incorrect, i.e., the tugs may not slope down enough to give the horse a lifting pull when throwing his weight into the collar. However, these tandem hitches are widely used in Canada and are very popular with farmers who have had experience with them.
The Gilchrist equalizer (See Figure 53) is the tandem principle with harness. It is inexpensive and simple. It is very similar to the hitch above described, except that rope pulleys are used, and in unhitching the tugs are unhooked at the hames.

Fig. 53—The Gilchrist equalizers, showing the tandem principle used with his rope harness. The rope trace from rear horse passes back over the pulley single-tree and then forward to the front horse of the pair.

The Beaton Equalized Hitch

This hitch (See Figure 54) was invented and patented by an Albertan blacksmith. The principle, it will be noted from the picture, is to place equalizer levers in a vertical position and attached to the harness on the sides of each horse. Any number of horses may be hitched string fashion with properly adjusted levers. In unhitching, the equalizer levers are unhooked from the harness and dropped to the ground. It will be noted that the chain tugs, which are a part of the hitch, are left attached to the implement in the field. When the team is unhitched, the harness is light. The hitch has many satisfied users, but it has not had sufficient trial in Montana for the author of this circular to make further comment on it.

Abreast Team Equalizers

Abreast team equalizers, as used for harrowing, etc., present nothing that is new to farmers who have been working smaller
teams. It may be pointed out, however, that if a considerable number of horses are driven abreast, buck straps can be used on horses which tend to get too far ahead. However, many farmers prefer to harrow by using their regular 12-horse equalizers and equipment on one of the implement hitches discussed later in this bulletin. They feel that best results are obtained by working the horses in the same place the entire working season.
Part IV.—Implement Hitches

Farm implements are made in stock sizes and are adapted to small teams. Big team operators need, therefore, to have implement hitches to which the regular sized implements may be attached, thus giving an efficient load for big teams. The following described implement hitches have been investigated and the description and photographs have been taken from farms where they have been thoroughly tested and found satisfactory.

Crow’s Nest Advisable.—Implement hitches should be made sufficiently strong to withstand heavy strains. In general, they should be equipped with crow’s-nests, or elevated seats, which raise the driver high enough above the implement that he may view each animal in the team, be above the dust and dirt, and also be in a position to see clearly where to drive.

The Talkington Implement Hitch

This hitch was developed by the Talkington Brothers, large team operators at Harrington, Washington. It consists of a triangular frame whose rear base is supported by two wheels, its apex or front point ending in a coupling pole, which fits into the front gears of a common farm wagon in the same way as a regular reach pole. (See Figure 55). The draft comes on a log chain which has one end attached to the equalized horse hitch. The chain is suspended under the tongue and the wagon gears at about the point where the ordinary double-tree is placed, the other end being wrapped around the implement hitch at some part which is sufficiently braced to stand the strain. The draft, therefore, does not come on the end of the coupling pole and king bolt of the wagon, the front trucks being used simply to guide and support the front of the hitch. The framework is constructed usually out of clear 4x4’s or 6x6’s, depending upon the judgment of the maker as to the strength of material which should be used.

Plans and specifications will vary according to the individual judgment and usages, but will be similar to plans given for the Umbewist and Armstrong hitches. If Montana farmers desire detailed plans and specifications, they may be obtained from the Montana State College Extension Service. The hitch can be used
Fig. 55—The Talkington implement hitch shown by drawing and photograph.

Fig. 56—Showing fifty feet of harrows pulled behind the Talkington implement hitch.
for drills, single discs and on fallow cultivation tools. Approximately 50 feet of harrows may be pulled. (See Figure 56).

**The Umbewist Implement Hitch**

This hitch is similar to the Talkington hitch. (See Figure 57). It, like the Talkington, is simple in construction and light, yet well braced. The tongue of the hitch is attached to the front trucks of a wagon, as in the Talkington hitch. The small box on the spring seat is to carry pebbles which the driver uses instead of a whip. Mr. Umbewist recommends a shorter reach if level land is to be worked.

![Fig. 57 — The Umbewist implement hitch, with some dimensions given.](image)

**The Armstrong Implement Hitch**

This is a shorter coupled, heavier built hitch than the two just described. It is perhaps stronger than is necessary, yet it gives satisfaction to those who have used it. Drawings and cuts give the idea of the working principle and construction details. (See Figure 58).

**The Booker Drill and Implement Hitch**

This home made hitch was developed by Mr. Booker of near Hatton, Adams County, Wash. It was brought to the attention of the Montana Extension Service through N. C. Donaldson, county agricultural agent of Adams County, Washington. It is a simple, easily made hitch of the triangular type, especially adapted to use with drills. Single discs may be hitched to it. Figure 59 shows plans and specifications of the hitch used by Mr. Booker.
A crow's-nest is supported by a false bolster which sets on the regular bolster of a wagon front truck, to which the hitch is connected. In the hitch shown in Figure 60, the crow's-nest has been taken from a discarded combine harvester. However, there should be no difficulty in making a crow’s-nest according to the directions given in the diagram. The coupling pole is ironed with angle irons to increase its strength. However, the pull comes through a log chain which is attached to the frame at a convenient point. This takes the strain off the wagon truck and distributes it over the hitch frame. Regular wagon wheels on an axle that has been sawed in two, support the cross bar of the hitch.

When used as a drill hitch, stub tongues are attached to the drills, the longer tongue being on the middle drill. Tongues on
Fig. 59—The Booker drill and implement hitch, with dimensions given.
the two outside drills are four feet long and the tongue of the center drill is eight feet in length. A chain is attached between the inside corner of the drill frame of each outside drill and the main beam of the hitch. This is to prevent the drills from becoming caught when turning corners. A marker is attached to the frame and extends over into the undrilled land to such a distance that the driver keeps his team in line with the mark. This is an excellent, inexpensive home made hitch, especially good for drills, and may be used for single discs.

The Witte Two-Drill Hitch

Figure 61 shows a simple, easily constructed two-drill hitch of the triangle type and which fits into the front wheels of the seat.

Fig. 60—A photograph of the Booker drill and implement hitch

Fig. 61—A drawing of the Witte two-drill hitch.
Fig. 62—Showing two of the Witte drilling outfits at work in the field. It is made on the same general principle as the Talkington hitch except steel braces are used from the coupling pole to the ends of the hitch. Figure 62 shows the drill hitches in operation. With these two outfits and three men, 130 acres were drilled per day during the seeding season. If further details are desired concerning these hitches, information may be secured from the Montana State College Extension Service.

Noble Airplane Implement Hitch

This is an implement hitch which has been used at the Noble

![Noble Airplane Implement Hitch Diagram](image)

Fig. 63—The drawing of the Noble airplane hitch, with dimensions given.
A Use long clevises and fairly long ring, so that there will be at least 10 inches space between the eveners.

B Halter tie chain.

C Draw chain—a heavy log chain with grab hook.

D Tie strap running from bit of inside horse through bit of next horse outside, thence back to home of inside horse, as per arrows.

N 30 foot evener, 4 x 10 inches, made of spliced 2 x 10's, so arranged as to break joints, extends across the front of the lead seeder, and is attached to and supported therefrom by strap irons and the thills to which it is bolted. It extends far enough out to the sides to form point of attachment for right or left seeders.

G 2 x 8 inch plank, long enough to extend from one thill to the other. It is placed upon and attached to the 30 foot evener by single king bolt at R.

F Bolts attaching thills to plank O. Heads are beneath and counter-sunk, so that plank O can rotate in any direction on evener N. This permits seeders to shift position as needed in going around turns. Seat is elevated on platform marked S.

Fig. 64—The drill hitch used on the Noble Foundation farms, also showing lines and buck straps in place on the team hitch.
Foundation. (See Figure 63). It is designed to set on a low wheeled wagon or a low wheeled truck and is used with harrows, seeders and other light tillage implements. The dimensions in the cut show a width of 30 feet. This may be varied according to the implements attached. Drills, as well as single discs, have been attached to this hitch. It has given very good results when not placed under too heavy a strain. Ten-foot extensions have also been added to the main beam, giving a 50 foot sweep for harrows.

**Noble Drill Hitch**

This consists of a cross beam which is supported by the front wheels of a wagon and by the wheels of the center drill, the tongues having been sawed off short so as to bring the center drill close to the truck of the wagons. (See Figure 64). The two outside drills have full length tongues. The accompanying drawing, which has been furnished through the courtesy of the Horse Association of America, gives all the details necessary for the construction of this hitch. Sixteen horses and three 11-or 12-foot drills with this hitch cover about 80 acres per day at the Noble Foundation.

**Noble Tandem Disc Hitch**

The type of hitch suggested for tandem discs is illustrated by Figures 44 and 67. In this type 2x6's (or better, 2x8's) are bolted across the tops of the discs. To these are fastened 2x6's in such a manner as to give flexibility but yet support the platform upon which the crow's-nest is erected. The foundation pieces for the crow's-nest will have to be attached in different ways, depending on different types of discs. However, they should be strongly attached and care should be exercised that the platform is securely placed, for an accident to the crow's-nest on an implement like a disc might prove fatal to a driver.
Fig. 66—A front view of the Noble drill hitch, showing crow's nest and method of attaching outside drill.

Fig. 67—The Noble tandem disc hitch in action. Fig. 44, in the equalized hitch, also shows this tandem disc hitch with teams in place, with lines and buck straps.

Chain and Pulley Duck Foot Cultivator Hitch

An 11-or 12-foot duck foot cultivator is considered a load for 12 to 16 horses when being used in plowless fallow operations. E. C. Hallman uses chain and pulley single-trees, driving two six-horse teams in tandem style. He uses the cultivator both for plowless fallow and for renovating brome grass sod. Figure 68 shows the method of using an extra heavy three-horse equalizer attached to each end of the cultivator frame. Where the equalized
bunch team hitch is used, a heavy pair of trucks should be attached to the end of a stub tongue. The cultivator probably lends itself best to the use of 12-horse tandem outfits because the frame itself serves as the long evener as well as a carrier for the short eveners, while the driver’s seat is both close to the team and is fairly well elevated. If it is advisable to raise the seat somewhat higher for heavy work a truss rod should be so attached as to prevent the front member of the frame from sagging in the middle. For unruly horses, it would be wise either to reinforce the two poles or to substitute one of heavy hard wood. Mr. Hallman prefers but one pole and hitches his green horses next to the outside in the wheel team. (See Figure 69).

**Hallman Plow and Implement Hitch**

This hitch (See Figure 70) consists of a heavy beam, mounted
Fig. 70—The Hallman plow and implement hitch. In the drawing below the brace is attached to the axle and they swing on the bolt in turning.

with a wheel at each end. The driver's seat is built upon the middle of the evener to a height of five feet. A pony engine gang is hitched behind the center. From the seat the operator can look well over his team and yet reach the plow levers whenever adjustments are necessary. Behind the plow may be attached a packer or harrow. This hitch may readily be adapted for use with almost any farm implement or combination of them. For attaching two drills, disc harrows or cultivators, place a pole in the middle of each implement. One of the drills should be coupled with a stub pole so as to admit of freedom in turning. The hitch is so simple that specifications need not be given. It is well adapted for use with the field feed rack.

**Duck Footing and Drilling**

In certain sections of the Great Plains, Russian thistles are a serious weed pest. A practice called “delayed seeding” is proving dependable and practicable. In so doing, the land which has previously been summer fallowed is tilled early in the spring,
Fig. 71—Herb Hallman's method of connecting a drill to the duck-foot cultivator.

lightly but sufficiently to cover and germinate such Russian thistle seeds as the winds have scattered upon it. Following germination of the weeds, a duck foot or some type of weeder is pulled ahead of the drill so as to completely destroy the young germinated weeds. The grain, therefore, is drilled into soil which is free from weeds and is apt to remain so during the crop season. Figure 71 shows a method used by Herbert Hallman for connecting a nine-foot duck foot and drill for such purposes. Note the stub tongue in the drill, which is made out of heavy bar iron and so constructed that it attaches to the frame of the duck foot cultivator by means of a coupling pin. When not desired, it can be uncoupled by simply removing this pin. Also note the method used by Mr. Hallman in erecting a platform and crow's-nest seat on top of the duck foot by means of angle iron bolted to the duck foot and cross braced.

**Hitching Two Gang Plows Together**

Montana farmers who have been using gang plows with six horses, but who now wish to save labor and shift to twelve horses and a four-bottom plow, frequently desire to learn some method of connecting two ordinary gang plows together. Specific details can hardly be given as gang plows vary with the makes.

Figure 72 shows a very satisfactory method used by Mr.
Augumbright of Loma, Montana. He bolts a heavy piece of bar iron to the front of the gang plow beams at the point where the regular clevises are attached. The bar extends to the left and is bent at a right angle and supported by the left plow beam or frame. The team hitch is shifted on this bar to the left so that it comes in the center of the line of draft between the two plows. This should be adjusted carefully. The rear plow is hooked to

Fig. 72—Mr. Augambright's method of connecting two gang plows.

Fig. 73—A second method, using a log chain between plows.
the back of this beam on the outside and the stub tongue is adjusted to the front plow frame to guide it properly.

A second method (See Figure 73) consists of simply extending a piece of bar iron as in the first case, but instead of bending the bar and using it as the means of pulling the rear plow, a log chain, attached to the outside end of the bar, extends to the clevis on the rear plow.

In pulling two gang plows with tandem teams of four horses abreast, the hitch being shifted as above mentioned to the left so as to be in the center between the plows, the team should be adjusted so that the horse on the off side walks in the furrow, as is ordinarily done.

Winnett Engine Gang Plow Hitch and Crow’s Nest

Tractor gang plows are plentiful in the dry farming sections, having been abandoned when many farmers gave up using a tractor during the dry years. Figures 74 and 75 show how these gang plows are hitched in big team practice and also illustrate how a crow's-nest may be constructed and the outfit used with a big bunch team.

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Fig. 74—The Winnett engine gang plow hitch and crow’s nest, with dimensions given.
Hauling Wheat

Man power can be multiplied when using large teams for hauling wheat, with an eight or twelve-horse team with its proper train of wagons, instead of the ordinary four-horse team and single grain tank. Bunched teams or string teams may be used for this purpose.
Bunch Tandem Team Road Outfits

Figure 76 shows the method used by E. C. Hallman in handling two grain tanks with an eight-horse bunch team, using chain and pulley tandem single-trees. A long, extra double-tree is attached by means of a draw bar strap to the regular reach of the wagon. The end of the draw strap is secured by means of the regular reach coupling bolt. A 2x6 is also extended on the top of the front tank, and to it are attached hangers to hold up the outside chain and pulley single-trees, which are in turn attached to the extra evener placed as above noted on the reach of the wagon. This takes care of the horses hitched tandem by means of a regular chain and pulley hitch on the outside of the center teams. A stub wagon tongue may be substituted on the trailer wagon but Mr. Hallman prefers the regular pole as it can always be hitched onto directly whenever needed. Figure 77 shows the wagon coupling clevis with cross bar pin. This clevis is used merely to hold the regular tongue of the trailer wagon in position. The clevis slips over the free end of the reach, back of the rear axle of the front wagon, and is attached to the iron on the end of the tongue of the rear wagon, thus allowing the pressure of this pole to be brought against the rear axle when going down hill. The trailer wagon is drawn by means of a log chain extending from the hammer strap of the rear wagon to the rear axle of the front wagon.

Standard Western Wagon Trailer Outfit

With the methods herein described, any number of wagons can be hitched as trailer wagons. In general, the wagons are not pulled from the hammer strap. The string team equalizer is attached to the front wagon by means of a crotch chain (See Figure 79), each end of which goes in the opening between the cross piece on the front gear and the front axle. (Note 16). The ends of the chains are held in place by a piece of hard wood

Note 16—Which is bolted to the top of the front hound and which supports the bolster of the front axle.
Fig. 78—A standard western wagon-trailer road outfit for hauling.

inserted through a link in such a manner that it is held by the front axle and the parallel pieces above it.

**Clamps**

A clamp, made out of a piece of flattened iron bent in U-shape with a plate on the bottom having a hook, is attached over the center of the front axle. It is made wide enough so that a hole can be bored in it to allow the king bolt to pass through. This clamp is left permanently attached to the wagon. A rod with a

Fig. 79—The crotch chain used in pulling the front wagon, as described in text.
link in it is attached to this hook and extends under the reach to the rear end of the first wagon, where it attaches again to another crotch chain which is coupled to the second trail wagon as described above. (See Figure 80). Any number of trail wagons may be coupled by repeating the above described equipment for each succeeding wagon.

Coupling Trail Wagon Stub Tongue

Two methods are recommended:

(a) The horn method—A steel horn eight inches to 10 inches long and which is bent upward, is attached to the rear axle by means of a clamp. (See Figure 81). The stub tongue has a link in the end which may be hooked over this horn. This allows freedom of play in the rear wagon and causes the rear wagon to trail well. Long tongues interfere with good trailing, but stub tongue's trail well. This system causes no inconvenience when the wagon box is taken off. Each of the succeeding trail wagons is equipped in the same way.
The Soach method—(See Figure 82). This is recommended by A. J. Soach, a blacksmith at Harrington, Wash. With this method a carriage for the stub tongue is made out of bar iron and is bolted both to the bottom of the wagon bed and to the rear axle. The stub tongue ends in a link which is fastened to this carriage, the link allowing free play backward and forward. Many large team farmers prefer this method, arguing that a shorter stub tongue may be used and that the trail wagons keep their position better than by any other method.

Brakes

In a hilly country it is necessary to have a good set of brakes on the trail wagons. Figure 83 shows a good method of attaching brakes. Long brake levers are connected by a rope which is attached to the brake lever at the driver’s seat. This means that the brake lever on the driver’s seat must be extra strong and be held with a perfectly rigid set of teeth in the brake lever guard. A spring is attached to the rear brake lever (See Figure 83) and
the rear bolster of the rear wagon in such a manner that when the first brake lever is released, pressure is brought on the rope from the rear and thereby pulls back all of the brake levers in the string. Rough locking may also be accomplished by means of the shoe shown in Figure 84.

**Angle of Draft**

It is of great importance that traces of all of the horses be at about the same angle or slope. The proper angle is at right angle to the slope of the horse's shoulder. This allows the horse to throw his weight against the load as he pulls. If the tugs tend to become parallel with the horse's back, he cannot pull very much and is apt to get sore shoulders. Figure 85 shows the large team starting out and the traces of the lead horses drawn so high that they have but little pulling power. The driver should weight the double-trees of the lead horses in such a manner that these traces will always be at right angles to the slope of the horse's shoulders. A farmer may have the idea that
the weight of the hitch requires extra power to pull it over the ground. This is not true providing the double-trees are not so heavy that they drag on the surface of the ground, because the power which has lifted the double-trees is in turn transmitted to the load. It is therefore a decided advantage to the horses to have heavy eveners. It holds down the traces to the proper angle of hitch. The only disadvantage is in the weight of eveners in changing and moving.

Fig. 85—When this team starts, the traces are lifted too high to maintain the proper angle of draft, the team having little pulling power.

**Rates of Work**

Twenty miles per day, where the turns are not too frequent is considered a good day’s work for a large team. The load should not be too heavy for the team to walk along with it at this rate. The following are the standards for a day’s work upon the Noble farm: (Note 17).

Three bottom, 14-inch gang plows, eight and one-half acres per day.

Four bottom, 14-inch gang plows, 11 to 12 acres per day.

**Note 17**—The standard for a day’s work will vary with the size of the field, the depth of plowing, condition of the animals, etc., but many big team farmers of the northwest call 20 miles an average day’s work.
Two 10-foot discs, hitched abreast each with a tandem trailer behind so that in reality it double discs a strip 16 feet wide, 38 acres per day. (This is double discing).

Eight 5-foot section harrows, 94 acres per day.

Three seeders, one 12 and two 11-foot, 80 acres per day.

Mr. Noble says that three 8-foot drills make a good load for 12 horses. Two 11-foot and one 12-foot drills, seeding 34 feet, is a 16-horse load.

**Feeding**

In feeding the large horse teams, the farmer is more interested in using the cheapest serviceable feed at existing prices than in feeding according to any ironclad prescribed formula. The following represents some interesting experiences of large team farmers. Mr. Hallman has had experience in feeding rye and oats. In the spring of 1923, oats were about 60 cents for a 32-pound bushel, and rye was 60 cents for a 56-pound bushel. Oats are about 20 per cent hulls, while rye is all grain.

Mr Hallman has had successful experience in feeding rye to work horses, but in doing so, he mixes it with cut brome grass hay or cut straw, thereby overcoming the great concentration of

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Fig. 86—Mr. Hallman's method of feeding rye with chopped straw or brome grass.
food in the rye. In feeding, he will first put about a shovel of cut hay into the feed box. Then he will put about four pounds of rye, chopped, on top of the cut hay, after which he mixes it with his hands. (See Figure 86). If he is working the team hard, he will increase this to about six pounds of chopped rye. If he has brome grass hay, he prefers to feed this chopped, but if not, he uses chopped straw. Mr. Hallman thinks that the feed depends on the relative prices of oats and other feeds and upon the feeds he has on hand. His experience has led him to the conclusion that there is no danger in heavy grain feeding when the above mixture is used. There is danger, however, in over feeding rye, as it is a heavy feed. Mr. Hallman says that if rye straw or any other kind of straw is fed, more grain is necessary than if straight hay is fed. He turns his horses out on good brome grass pasture at night and finds that this keeps them in fine condition.
Mr. Noble states his experience as follows: "At Nobleford, we feed the horses on such roughage as we have. For two years we fed rye straw straight for roughage. We have fed corn and bran, mixed half and half, during the time the horses and mules were at hard work. Have also fed one-third oats, one-third corn and one-third ground rye, about six pounds of this per feeding three times a day to good sized work horses or mules. We have used this, however, when feeding straw only. We have worked the horses at the Cameron ranch entirely on rye straw when we don't have anything else. However, our animals were all mature. We supplemented pasture when we had it.

"I think that horses do better on good rye straw than on poor wheat straw. We have had them leave medium to poor oat straw and eat the clean rye straw. We prefer, however, to feed green oat hay mixed with some straw, giving a bundle to each horse, with some straw in addition. We plan each year on seeding about 40 acres of winter rye near the barn of each farm unit. As soon as the rye gets big enough, we let the horses out at night to run on this rye pasture. Of course, during this time, they get their regular grain feed and have their roughage in the barn. Our experience has been that our horses have done very well and we get a lot of good feed out of the rye pasture. We had a good deal of experience in feeding rye to horses while working. Rye is our most dependable crop. We usually have a lot of it even in the poor years, but our oats have not done as well in the poor years. I like to mix oats and rye half and half and grind them together. I have a rolling and crushing mill instead of the regular grinder. When the horses are running on grass, the bran is not needed. The bran is used to get away from the heaviness of the grain feed, especially when rye is used plentifully. The grass supplies the same laxative principle as is contained in the bran. If you are working the horses on grass, they are reasonably full in the morning and will get along with a light feed at noon. We try to get them on the grass as early in the evening as possible."

Mr. Gilchrist at Scobey, Mont., turns horses loose for watering at noon. The have not been fed hay since 1916, but principally oats, wheat and rye. In 1920, they were fed one-third rye and two-thirds ground oats, together with oat and wheat
straw. The horses stood the work better than any other way they had tried.

Mr. Frank Cusker has fed his horses soaked and ground macaroni wheat during the period when this type of wheat was so cheap.

**Feed Reserves**

Not only must the big team dry farmer plan on producing a plentiful supply of feed each year, but experience has shown that he must be prepared for those years in which no feed (for various reasons such as hail, drouth, insect pests, etc.) will be produced. Such years can be met only by heavy cash outlays for purchased feed, or from reserves of feed built upon the good years. Figure 88 shows the yard of a large team farmer who works his horses on bundle oat hay cut a trifle green. This man always plants each year more than double the acres of feed that he believes he will need. Thus he has a big reserve supply of oat hay in the stacks. This is an important element in big team farming in the northern Great Plains and it is doubtful if big teams will be successful in the more arid districts unless this practice is regularly followed.

**Low Cost Wheat Growing in Montana**

There are twenty million acres of dry farming benchland in Montana which have been settled since 1910 and upon which hard spring and winter wheat are the best adapted cash crops that
have been developed thus far. The profitable use of these wheat lands for farming purposes depends primarily on the raising of wheat at low costs or at costs sufficiently below the market price to produce profit. All will agree that the farmers tilling these lands should diversify to the extent at least of raising their living, and in many cases taking care of such overhead expense as taxes, from good gardens, Shorthorn milk cows, hogs, poultry, beef, etc. But, nevertheless, the farming industry on much of these lands raises and falls with its cash crop.

All farming districts have their cash crop or crops around which the farming is built. The kind of cash crop is determined by nature. Man can take the land and use it or he can let it alone, but he, as an individual, cannot change nature's and society's decree as to what crop or type of farming will predominate. In certain sections of the south this cash crop is cotton. In Iowa it is corn, much of which is used in fattening hogs and steers. In Wisconsin it changes to dairy products; in southern California, citrus fruits; on the Texas plains, beef cattle.

For the fertile dry land bench lands of northern and eastern Montana and the rich intermountain basins like the Judith Basin, the leading cash crop is wheat. These lands were brought into cultivation when the purchasing power of wheat was from 30 to 40 per cent greater than it has been in 1923. The herds of cattle and big bands of sheep, during the period of settlement, almost disappeared from these prairies and in their place arose farm homes, barns, buildings, fences, roads, bridges, schools and villages. The low price of the land, together with war conditions, was capitalized on the basis of a more intensive use, supporting more people and community enterprises than had been possible in the pastoral days.

Now that the war smoke has cleared away, the world finds itself with more wheat than consumers can buy at high prices in the average year. War pressure caused an enormous increase in wheat throughout the world, especially in this country and in English speaking provinces. Prior to the war, Russia exported practically 25 per cent of all the wheat that was exported by exporting nations, but now with Russia practically eliminated from world wheat statistics it is estimated the acreage elsewhere in
the world is 21 per cent greater than pre-war. The increased acreage in the United States is approximately 23 per cent, while in Australia it is 51 per cent and 65 per cent in Canada. Low prices in the United States are related to the international world price level and not to the internal price level because it is the exportable surplus which fixes the price of domestic wheat. (Note 18).

It is, therefore, self evident that some one will raise less wheat. Will “some one” be the hardy, pioneer farmer now on Montana wheat lands or will it be some one else crowded out of wheat raising in the next ten years? Unless fundamental changes take place some wheat raisers must go out of the business and naturally it will be those who have the highest production cost and who are growing their wheat at the greatest losses. The future of Montana wheat farming in part, therefore, turns on the ability of Montana farmers to produce wheat and get it to the markets cheaper than wheat from other sections of the United States.

Montana Wheat Growing Pro and Con

That the problem of Montana wheat costs may be clearly set before us, let us list, in two columns, the advantages and disadvantages of growing wheat on Montana dry lands.

(1) Produces the highest quality of high gluten hard spring wheat in the world.
(2) Cheap virgin lands especially rich in lime.
(3) Large percentage of clear working days during production season.
(4) Level lands adapted to large fields and big teams or tractors.
(5) Highest yields per acre of spring wheat section in U. S.

(1) Distance from market, 1000 miles to Minneapolis.
(2) Variable seasons subject to drouths, hot winds, etc.
(3) Wheat can not be raised as a side issue or supplemental crop such as in the Corn Belt where it is used for a nurse crop for clover.
(4) Erratic yields where the gambling element must be offset by reserves.
(5) Alternate cropping.

Note 18—Something of conditions that affect the price of wheat in Montana is contained in the bulletin “Montana’s Agricultural Outlook for 1925,” published by the Montana State College Extension Service.
(6) Low prices.
(7) Scarcity of labor.
(8) High wages.
(9) Conditions adapted to cheap harvesting methods, small combines, header barges, etc.

Spring wheat that produces high gluten flour which is so desired by American bakers is produced primarily in the four northwestern states of Minnesota, South Dakota, North Dakota and Montana. The United States Department of Agriculture, reporting for 1923, gives the following average yields for the above states: Minnesota 12.5 bushels; North Dakota 7.1 bushels; South Dakota 9.5 bushels; Montana 15 bushels; average of all spring wheat in the United States 11.5 bushels. Such soil and weather conditions as are necessary to produce hard gluten wheat are to be found only in a small section of the United States, of which Montana with her twenty million acres is a part. Similar conditions prevail across the Canadian line, in Alberta and Saskatchewan.

The problem, therefore is: Can Montana work out a system of farming that fits its land and in which costs will be sufficiently low as to make the operation of the wheat lands profitable, even though the price of wheat has a low purchasing power? (Note 19).

This bulletin from this angle argues that Montana's wheat raising costs can be made the lowest of all of the spring wheat sections of the United States. Wheat costs, aside from the land charge, are grouped primarily about two major operations: First, cheap tillage methods; second, low harvesting and threshing costs. Assuming that wheat is to be raised on Montana tillable dry

Note 19—This bulletin on “Big Teams in Montana” is the third of a series by this author and concerning the dry land regions of this state. For a further discussion of our Montana dry land problems see the bulletins “Successful Dry Farming in the North Central Montana Triangle,” and “Reducing Wheat Harvesting Costs,” both published by the Montana State College Extension Service. The bulletins may be had by writing to Bozeman or from your county agent.
lands, this circular is devoted to low costs and high efficiency in tillage and seeding as gained through the use of big teams.

There are always two sides to the farm price question. Low cost of production is one side and the market price the other. This circular does not discuss the marketing and price phase and is not to be construed as an argument for either inefficient marketing methods or low prices. It is concerned primarily and almost wholly with reduction of production costs.

**Balanced Farming and Profits**

Wheat raising dry farmers constantly endeavor to balance the proportions of the land, capital, equipment, (such as machinery, etc.) and labor, (both that of the farmer and that which he hires) in such a way as to get the largest net returns on the "scarce" element. In arriving at this balance, he proportions things so as to economize and to make the "scarce" elements go as far as possible and to mix with these as much of the plentiful things as are necessary to make the "scarce" element yield the largest labor return. (See Note 20). In Europe, where land is scarce and labor plentiful and cheap, the farmer masses large quantities of cheap labor on an acre of high priced land to get the highest yield possible. In Montana these conditions are re-

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**Note 20** — The "labor income" is what the farmer receives for his wages and management after he has deducted from the total farm receipts the running expenses and six per cent on his capital investment. Included in the labor income is the house rent and such quantities of food, garden truck, etc., as the farm produced.

**Note 21** — George Washington, while President of the United States, remained deeply interested in agriculture. During his term as president of the United States, he carried on an extensive correspondence on farm matters with Arthur Young, a celebrated English agriculturist. In a letter dated June 18, 1792, he said: "You seem surprised, and no wonder, to hear that many of our farmers, if they can be so called, cultivate much ground for little profit, because land is cheap and labor is high."

In their correspondence Mr. Young wrote President Washington asking a number of questions concerning farming in America. Being confined to the executive mansion and, therefore, more or less out of touch with agriculture, he asked Thomas Jefferson, who was one of the foremost students of agriculture in his time. To some of Mr. Young's questions, among the answers he gave, is the following:

"Paragraph 7: "That in America, farmers look to labor much more than to land, is new to me' but it is a most important circumstance. Where land is cheap and rich and labor dear the same labor spread in a slight culture over one hundred acres, will produce more than if concentrated by the highest degree of cultivation on a small portion of the land."
versed, the dry lands being plentiful and cheap, rents not excessive, and the farmer able to get as much acreage to farm as he can take care of and manage properly. This principle has long been recognized in American farming. (Note 21). In Montana, the farmer’s labor is the “scarce” element which must be used to the highest advantage.

Place of the Large Team

Recent studies of the weather at Havre, Montana, since 1880, in its relation to probable crop production have been made by the Montana Experiment Station. These studies, combined with the experience of dry farmers in northern Montana since 1910, clearly indicate that the weather of the dry land districts is very erratic. In some years the weather combination is such as to produce large grain crops while in other years the crop borders on failure even for the best farmers. The wheat farmer, in making a calculation, must observe not only the balancing of the factors as mentioned above, but must have seeded enough acres of grain that on the good years he has a large quantity or surplus to sell. At the same time he must carry on the work of production with such small out-of-pocket costs (Note 22) when the poor year comes he has lost only his own labor and what the farm contributes in the way of feed and living. He has farmed in such a way that most of the other expenses, such as hay, horse feed, etc., are furnished by the farm and stored up from the good years. While this farmer will have to draw from his bank and feed reserve which were built up in the good years with big crops, to meet his taxes and other overhead expenses, he will have low operating costs otherwise and, if he has sufficient feed reserves, one or two bad crops will not bankrupt him and force him to quit farming. (Note 23).

Note 22—Those expenses which the farmer pays out cash for, as machinery, hired labor, etc., as contrasted with those things which are produced and consumed on the farm like feed, pasture, food for the family, etc.

Note 23—The subject of “reserves” for the dry land farmer is fully discussed in the bulletin “Successful Dry Farming in the North Montana Triangle,” which may be obtained from the Montana State College Extension Service, Bozeman, or from county agents.
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(Continued on Next Page)
CONCERNING TRACTORS

This bulletin is not intended in any sense as an argument against the tractor on the Montana dry land farm. There are many enthusiastic and successful tractor farmers in Montana. This bulletin presents the views of different farmers on the question of big teams, and deals wholly with that subject. That individual expressions favoring the big team instead of the tractor may be found in the bulletin, is not to be taken as a general condemnation of tractor farming, but rather as the experiences of men who have found big teams more suited than tractors to their farm management scheme. Heavy initial cost and added upkeep cost on tractors are the reasons why the majority of farmers will be interested in expansion through big teams rather than through tractors.

Note.—In making this table Sundays were not excluded. It is assumed, however, that the ratio of Sundays is the same with working days as with non-working days and that the true number of working days is the number given with one-seventh deducted.
Part V.—Experiences

In this section are given the experiences of farmers of Montana who have driven large teams successfully. It is believed that the printing of these letters will add weight to the argument in favor of big teams in Montana, for these letters are the voluntary expressions of men who have become convinced that big teams have helped increase their farm profits. Many of the questions that arise in the mind of the man who is considering the use of big teams, are here answered. We urge the careful reading of these letters, which form an important part of this bulletin.

This Railroader Learned the Trick

"I began driving big teams about 1918. Before this time I kept from one to three hired men, each handling a four or six-horse team. As I had bought more land in 1917, we began to feel the effect of the dry years and it became plain to me that I would have to cut out some of my overhead expenses. As my biggest current expense was for hired help, I decided to double up and do more work myself.

"I had been figuring on this plan for some years and had tried out various plans. For instance, I would drive a harrow team along beside the drill to eliminate an extra operation. Also, at times, I would stand on the

Fig. 89—Two views of the team driven by Charles R. Elliott, of Ft. Benton, Montana.
drill and drive a double disc on one side and a drag harrow on the other side. This was like Three-in-one oil, for in a trip around the field I covered three operations. I had another combination rigged up as follows: eight horses hitched to a double disc, with drill hitched behind and a harrow behind the drill. As that was too much load for horses I did not use it long.

"How did I happen to get the big team idea? I hardly know, but here are some of the reasons. At home on the farm in Ohio two or three horses made a team and I have no remembrance of ever seeing four horses hitched together until my father went away from home one day and with the help of my younger brother we hitched four horses to a riding spring tooth cultivator. We had them strung out with each of us driving a team. The idea had come to us from father, who told about a trip to the International Show at Chicago where he saw a man driving six horses all by himself. Another reason, was that I had spent a few years on railroads in the capacity of station agent and telegraph operator. I had observed that an engineer, supported by the same sized crew, could handle a big string of cars with a big engine just as easily as he could handle a smaller string with a small engine. Therefore, I thought, why not 12 horses and six plows rather than six horses and three plows.

"Of course, after I had plowed with 12 or 14 horses, the idea of driving around the field with a single drill looked to me like a waste of time and effort, so I got the idea of taking a drill along on each side of my first drill, and later the idea of two extra drills on one side and one on the other. With 14 horses on six disc plows, and with drag harrows behind, I now handle about 10 acres per day; with 13 horses on three drills, covering 29 feet, I drill 40 to 50 acres per day; with 14 horses on four single discs cutting 31 feet I cover 65 acres per day.

"Since I began to use large teams I have put in from 500 to 800 acres per year, averaging about 600 acres per year. My hired help bill, aside from harvesting, runs from $50 to $100 per year."—Charles R. Elliott, Ft. Benton, Montana.

An Experience From Sackatchewan, Canada

"In our locality there has been but one good crop in seven years. However a few farmers are holding their own, and a few are actually going ahead. How did they do it? I will tell our own experience.

"To reduce the number of hired men needed, we had to increase the number of horses per man. Of course, the men objected to driving more horses. That's nothing new. They've done that since four horses were considered enough. At first the neighbors laughed at the idea, but one by one they are getting their big outfits rigged up. We do less work in taking care of 16 horses than most people do with eight. We seldom put a horse in the barn. We have feed racks to use in the field with room for a load of hay and stalls and feed boxes for the horses. We have a tank load of oats along. We always turn the horses loose at night making sure that they can get water during the night. We never curry our horses for
we think that rolling answers the same purpose. We don't have a barn to clean, we only move the feed rack. In the morning we feed oats and tie the horses up and by the time they have eaten we have them harnessed. The harness is left lying on the ground behind the horses where it was thrown the previous night. Most of it is old belting and will take no harm, but the collars should have some kind of shelter to keep them dry.

"At noon the horses must be watered. At night they must not be turned loose before they are through eating their oats. Keep a close watch for sore shoulders, especially if you let the pads get wet.

"There has never been an accident with one of these large outfits in our locality yet, but I must warn the reader who plans to try one to watch out for bad storms. If a hail storm should strike one of these outfits it might cause a bad runaway. Better unhitch in time."—James E. Moscrip, Major., Sask., Canada, as reported in the Grain Grower's Guide.

**A Letter from Lloyd Talkington**

"The big team has been found the most practicable method in this country. It has been adopted by a majority of the farmers and the rest intend to get into big team farming in the future. My brother and myself raised 40,000 bushels of wheat on 1,200 acres in 1923 without any hired help until harvesting. We stick straight to summer fallow so have 1,200 acres in crop each year and another 1,200 acres to summer fallow. In plowing we make an average of 18 acres per day per team, each using 20 mules on six 14-inch bottoms. Our weeders are 12-foot width and we work three of them to each 20-mule team, covering from 40 to 65 acres per day. This is the hardest work of the year for the animals on account of the heat and the soft ground. Our combine is a 20-foot cut and handles from 40 to 50 acres per day on the average run. We work our drills somewhat different from most of the farmers, as we pull only two 11-foot drills with a 24-foot

![Fig. 90—Lloyd Talkington with his 20-mule team at work in the field.](image-url)
iron harrow in front of them and a similar harrow behind. This makes a load for 20 head of mules."—Lloyd “Shorty” Talkington, Harrington, Washington.

From an Experienced Northwest Farmer

“I have a new—tractor, good as new, which pulls six bottoms, turning seven feet of ground. I can pull this same load with 18 horses, plowing two inches deeper, or I can pull it to break sod if I use 20 horses. I find that it costs $5.00 per day to plow 12 acres with horses, and $20 per day to plow the same with the tractor, not counting the up-keep and depreciation on the machine. With horses there are no delays with breakdowns and it is much easier to get a man capable of driving the horses. An honest worker can handle them just as easily as he can four horses, although it takes longer to hitch up. One man handles the team alone, camping with the outfit in the field and doing his own cooking.

“I have been 45 years on this ranch and I have driven large teams all over Montana and the northwest territory. I have driven horses, bulls and even dogs, also Red River carts and Indian travois, and I know that the biggest mistake the farmers have ever made was to try to farm with engines of any description. Let a man take the same money required for an engine, and put that money into mares, then he soon will have several times the power he can use, and it never gets too cold nor tough for this power. There is more power being added every year that you can use where your engine would be a ‘dead one.’ You can raise all the horses eat.

“We break wild bronchos, fresh off the range, in this team. We just rope them, drag them to the farm and hook them up. Once hitched in with the team they simply have to work. If they fall they are dragged, and soon learn to behave. For harness we prefer chain tugs. We use halters with bits snapped into them, and no blinders. I surely do believe that large teams are practical and economical. It is the only way I can figure out to bring our lands into profitable use with help and money scarce, and wages high.”—W. J. Winnett, Winnett, Montana.

He Learned to Do Two Men’s Work

“I first started to use the “strung out hitch” in the summer of 1919. I saw the multiple hitch explained in the Breeder’s Gazette and as I always liked to work lots of horses I made a modified form of the multiple hitch and tried it out. I have been using it ever since with from six to 14 head of horses. I couldn’t afford to hire another man, but I had the extra horses and plows. The big team made it possible for me to do two men’s work. I have plowed between nine and ten acres a day with this outfit, drawing a harrow behind the plows. I use regular work harness without butt chains. I can unhitch, come nearly a mile to my barn, then water, feed and unharness the 14 head in one hour. I intend to try 16 and 18 head this next spring.”—Orville Conant, Judith Gap, Montana.
Where Labor Saving is Proven

"We have been using large teams for a number of years,—12 to 20 head to the team. The team we generally use is 16 head, pulling a 10-foot tandem disc, a drill and a packer, which completes the job called "stubbing-in" at one operation on land fallowing and the summer fallow crop. We generally use 12 on a 14-inch triple gang plow when we are summer fallowing and wish to plow deep. We have plowed some with a six-bottom engine gang, working 20 head, but I would not recommend so large a team, especially in fly time. We use a pulley hitch which, I am told, is recommended by the Percheron Society, and which is commonly used in Washington. We bought the pulley, chains and rods and made the hitch ourselves. Each two-horse team works on a two-horse evener the same as they would if only two horses were being used. We use common farm harness and have had no difficulty with either harness or hitch. We make 20 miles per day with the large team just as we do with the smaller team, which amounts to 24 acres per day with a 10-foot machine. I am positive that the large team is a labor saver. We have never run below 300 acres of crop per man with each man working an average of eight horses. The amount we have in crop each year runs between 1,200 and 1,300 acres."—Spear Brothers, Cabart, Daniels Co., Montana.

A Result of the Hitch Demonstration Train

"I have used the 12-horse hitch on a three-bottom, 14-inch plow, plowing eight to nine acres per day. A seven-foot drag is pulled behind the plows. I can handle a 10-foot tandem disc and an 18-shoe drill behind it, covering about 15 acres per day. I had some difficulty with the heart-shaped rings. I had pieces welded on where the equalizer clevises worked and had no more trouble after that. I can do as much work with my team as two men can do with six horses each.

"I have had no difficulty with the hitch or the harness, a local blacksmith making my equalizer hitch. I farm about 400 acres with this team and I saved the price of the plow and hitch the first year. Am using a engine plow. Have had my hitch so arranged that I have no horses on the plowed ground. They work three in the furrow and nine in the stubble. I broke 30 acres of sod with three breaker bottoms early this spring and did a good job. Am pleased with the whole outfit."—James Swindle, Lanark, Montana.

An Experience Review of Herbert Hallman

During the season of 1923 Herbert Hallman of Acadia Valley, Alta., seeded 750 acres of wheat and oats and summer fallowed 500 acres. He made no outlay for hired help up to harvesting and threshing time. He fed his team oat bundles and turned them on good brome grass pasture at night.

When he lost his modern horse barn by fire, he built a feed trough along one side of his machine shed and kept his teams in the machine shed. He used no partitions in the barn between teams. The doors being 16 feet wide,
Fig. 91—Three views of Herbert Hallman's big team plans. Above, his 12-horse team in the field; center, the machine shed which was used as a barn when his modern horse barn burned down; below, the feed box along one side of the machine shed.

He drove his teams into and out of the barn as they worked in the field. He used a home made harness, described under the harness section of this bulletin. He used discarded strips of thresher belting for the tugs, back-band and belly-band. He says he prefers the open-throat, "Lankford" type of collar, to which the hames are fastened permanently.

He practices delayed seeding, using a duck-foot cultivator ahead of the drill, and covering 20 acres daily. During 1924 he seeded 1,150 acres with two such outfits. He harvests his crop with the header, leaving the stubble
as high as possible. He says this stubble holds snow in winter and protects the soil from losing its moisture.

In handling his team, Mr. Hallman puts the fastest six in the lead, with the fastest ones of these six at the outside and the slowest in the center. The slower horses go into the rear team, with the very slowest of this team placed at the center. He believes the single-tree should be wide enough to make it difficult for the horses to become entangled.

He Believes it “Depends Upon the Man”

“I believe that in talking in favor of big teams you will have to pick your man. Some men are rather weak at heart, or, as we say, small potatoes when it comes to trying something new and a little hard. They have to be shown. Last year I took a young man who had been raised in town. He had held a job carrying mail, using one horse. He had never driven anything larger. I stayed with him most of the first day, then left him. He got along fine with my big team. In fact, he doesn’t feel right any more if he can’t drive eight horses or more.

“This spring my neighbor bought a nine-horse Talkington hitch and a three-bottom plow. It was just a matter of showing him how to tie his horses ahead and how to use the buck strap. In my own mind I am convinced that where a man intends to farm in this country he must use big teams or quit. In fact, I get more ‘kick’ along the big team line than I had expected, because some of this country is settled up by farmers from the east, who farm ‘small potato style’ even yet.”—H. H. Schnad, Miles City, Montana.

The Big Team Is No “Snap”

“The 12-horse team is no snap and I wouldn’t advise everyone to try to use one. There is no great difficulty, however, for a person who has patience, or who has horses quiet enough. They work best in plowing, where I used three teams of four abreast. The leaders work against the swing team over a pulley and this eight against the pole team on a heavy iron equalizer standing up and down. I believe that for the eight against four a double block and tackle would be better than a short iron evener, for then there would be no danger of the four trying to pull the whole load. In the field they are not much harder to drive than a four-horse team strung out. On three discs, side by side, I worked two six-horse teams. This seemed to be quite a load for them but it took such a swath that it did not take long to go over the summer fallow the first time. If the horses know their own stalls and go directly to them when brought in from pasture or when unhitched from work, there is no great task in unharnessing or harnessing them. In fact, the worst part of the job is in leading them out of the barn in coupling them together. My wife often helped me at this part of the job. I cannot get out of the door handily with more than two, so this means six trips from the barn to the tank. I believe that when I do it again I will not unhitch at noon unless I am close to the house, but
will water them from a bucket and feed from bags without dropping the tugs. My outfit plowed 180 acres last spring in about 22 days. A man could not expect many hired men to take care of an outfit like this, as in rocky ground there is always the chance that he might get bucked off the lead plow where he rides and get plowed under by the back one. One surely feels that he is accomplishing a lot, anyhow.”—Clarence H. Owens, Turner, Montana.

It Solved the Problem of Educating the Boys

“I have been driving a 12-horse team since last fall and feel perfectly satisfied with the results. It solved an economic problem, that of keeping the boys in high school, for me.

“I have used an eight-horse team on a triple plow for several years. This was called a big team in this community and was known as “Levang’s herd of horses.” The Farm Success Train gave me courage to try a 12-horse team and it is now considered good style up here to drive big teams. The outfit I have been driving this spring has been on an eight-foot trailer disc and drill. This outfit has covered 400 acres, which is more than I intended to cover, but I had 150 acres of fall plowing which I put into flax and had to disc it to kill the weeds before seeding the flax. The “short-cut” harness and the modern hitches are a great convenience but I do not consider them an absolute necessity. I had a barn fire a few years ago in which I lost most of my harness, so I am using ordinary plow harness, most of it with belting for traces. For a hitch I took the ordinary four-horse iron scissor plow eveners and drilled new holes so four horses pulled by the lead rod, where I had a plow pulley for the first and second back of fours. The extra cost of the 12-horse hitch and harness was absolutely zero, as I used what I already had around the place. My hitch works on the same principle as the one shown on the Farm Success Train.

“As to the number of acres covered in a day. It is not fair to make a definite statement, as it depends upon the kind of horses, depth of plowing, or the angle of the disc and the pressure used on the drill; but I will say a horse will do just as much work in a big team as he will in a small outfit with the same feed and care. We have 600 acres in crop this year.

In closing I want to say that I consider the “crow’s nest” the first requirement in driving a big team, as you can look over your horses and have perfect control of them at all times. I use only one set of lines, on the first pair. I have used all kinds of horses in the outfit,—unbroken “brones,” “plugs” and “buzzard heads,” and after I get them into the hitch it’s a go. The only precaution I take is to put a neck-yoke on a horse I am afraid will cause trouble in the team. In a few days he gets used to the chain and finds his place. I would not recommend the big team as the best place to break horses but will say that you can handle any horse here that you can handle in a four or six-horse team.”—Nels Levang, Medicine Lake, Montana.
The Experience of E. C. Hallman

Mr. Hallman's farm consists of 1,600 acres, of which 1,280 acres are planted to brome grass. Three-fourths of this grass he cuts for hay and seed, the remainder being renovated by cultivation and lightly pastured during the season. By rotating the renovated plots, all of the grass becomes renovated once in four years and three crops are taken off.

Mr. Hallman devotes 320 acres to grain growing on the three-year rotation plan, seeding wheat then oats, then summer fallowing for a year. When the soil fibre becomes depleted and soil drifting begins to be a possibility, he seeds the land to brome grass, while a half section of old brome grass is broken up for grain growing. Mr. Hallman, with a 12-horse team, handles all the work in seeding 200 acres, summer fallowing 100 acres and renovating 300 acres of brome grass.
Considers His Big Team a "Practical Success"

"The 12-horse team on the Horse Association hitch is a success with us and will become a permanent part of our equipment. When I say it is a success, I mean that it will work under almost any condition. Our ranch consists of fields of all sizes and shapes, with many drawbacks not commonly met on the ranch where grain raising is the main object.

"Our outfit consists of three drills, two nine-foot drills and one eight foot. We have used 16 horses to the team but I believe 12 horses of average size will handle our outfit under average conditions. Regarding the construction of the hitch: we used about twenty-five dollars worth of oak. Lighter material might have worked, but our hitch is now good for many years. We have our own single-trees; we like a light wagon single-trees best of those we have used. We worked up much old iron from the junk pile but bought perhaps twenty-five dollars worth of iron. In addition we bought two log chains. Our job in making it took longer than I expected but we made all our parts quite heavy so that possibility of a break is practically eliminated.

"We seed 40 acres per day with ease. This is three times as much as we ordinarily seed with a single drill so we have no complaint even if this is not an average big day's work. I believe the outfit will do 60 acres per day. We have extension hoppers on the drills, making the three drills hold 18 bushels of grain.

"At noon we feed our horses at a long, portable feed rack which is placed convenient to water and to the field work. We turn the horses loose from the hitch and they go to water (sometimes at a gallop), then fall into place at the feed rack without confusion. They feed in hitching order back to work.

"I consider the big team a practical success for any farmer using many horses. It enables the farmer to use the highest class of hired labor and pay well for it. More work is done and the horses will not suffer by incompetent hired help. In many cases the farmer is able to eliminate all hired help and do the work himself. All in all, I believe the big team to be a great stride forward toward efficiency, economy and satisfaction."—W. S. Acton Lewistown, Montana.

Cuts Cost of Producing Bushel of Wheat

"I have used the big team for about six years and must say that it is a big saving in expense paid for hired help. Also I believe in cutting the expense of raising each bushel of wheat.

"Last spring I kept a record of plowing and, as you know, it was a time when feed was short. I had no oats and only about three tons of hay. I plowed or summer fallowed 225 acres. Some of this land is a mile and a half from home so it took some time between home and the field. On 125 acres, closer to home, I averaged nine acres per day. On the balance I average eight acres per day. I know from experience that if I had the grain and hay I could average an acre per hour, or more."
"I have no disc big enough to tell how many acres I could disc in a day with my team. I have been using a spring-tooth harrow, 17 feet wide. I use 10 head of horses and average 35 acres per day. I have used six horses on a 10-foot drill and averaged from 25 to 30 acres per day. In plowing I use a three-bottom, 14-inch plow, with a section of harrow behind."—W. L. Zanto, Highwood, Montana.

Fig. 93—Views of the team used by C. Gilchrist & Sons, Scobey, Montana.

How Gilchrist Ties His Team

"As to the swing and pole teams, we just tie their heads together and do not tie them to the leaders or anything else. We just drive the leaders and the others follow right along in their places." (Reference to the Gilchrist harness and hitch will be found in the first part of this bulletin).—C. Gilchrist, Scobey, Montana.