

# Building A Sweep Rake

MACK M. JONES

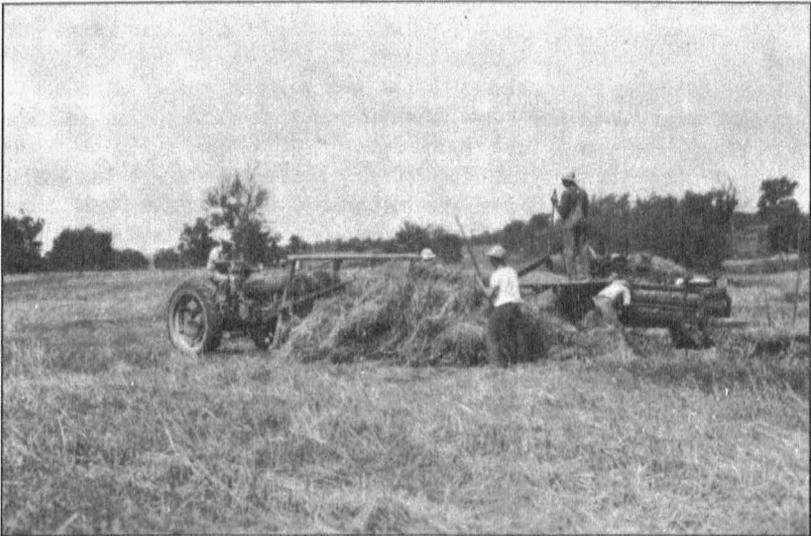


Fig. 1.—The push rake is the type most extensively used in Missouri.

The sweep rake has proven to be a great labor-saving machine in hay making. It has been found very useful also for such work as hauling shocked grain to the threshing machine, picking up combined straw, moving shocked fodder, and collecting and moving brush.

## Types of Sweep Rakes

There are two main types of sweep rakes, and anyone who considers building a rake should understand them, and the conditions under which each is best suited. He then is in position to decide which type better meets his needs. Confusion and disappointment can be avoided by clearly distinguishing between the two types, which are: *Push rakes*, and *transport rakes*.

### The Common Push Rake

This is the type which has been used most extensively and quite successfully in Missouri. It was first used as a horse-operated rake, and later as a tractor-operated rake. This type pushes the hay with the teeth down. Although many of these rakes have lifts for lifting the teeth, the rakes are not generally used to carry the load with the teeth lifted. Even those strong enough to lift and carry the load are most commonly used simply to push the load with the teeth down. In this way, much larger loads can be moved, and the hay handled in less time.

Push rakes are used principally for short hauls—usually not over a quarter mile. They are quite satisfactory for moving hay to a baler or to a stack in the field, or even to a barn adjacent to the field. These rakes are simpler and do not require heavy-duty lifts, and consequently are easier to build and cost less than the heavier transport rakes.

These common push rakes are not generally suited to long hauls, however, even when the loads are carried rather than pushed. The main reason for this is that their capacity is too small. *Loads moved by sweep rakes are often deceiving.* Many persons believe that loads as large as a half ton are commonly moved with push rakes. Careful checks and observations reveal, however, that such loads seldom exceed 500 pounds, more often ranging between 300 and 350 pounds (about 4 or 5 bales).

In order to be suitable for long hauls, a rake should have a large capacity. Otherwise, very little if any time can be saved over other methods of handling hay.

### The Transport Rake

For hauls longer than one-quarter to one-third mile, a transport rake which carries the load and which has a large capacity is much more efficient than the push rake. In general, transport rakes should have capacities of at least 700 to 1000 pounds. This is especially important for long hauls. Transport rakes should also be strong and well-braced, and they must have powerful lifts. They are commonly mounted on the rear of trucks or old cars.

If a transport rake of suitable capacity is to be powered by a tractor, then the rake should have wheels of its own. The rake may be pushed or pulled (probably better pulled), but in either case it should have its own wheels.

A satisfactory transport rake, since it is larger and stronger than a push rake, and since it must have a power lift, is more complicated and costs more to build. Transport rakes are therefore not commonly used nor recommended where the simpler push rakes are satisfactory. For long hauls, however, where push rakes are not well suited, transport rakes are worth their extra cost.

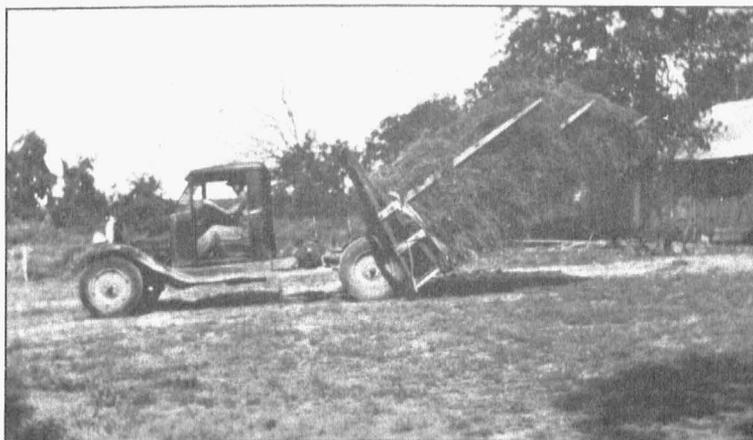


Fig. 2.—Transport rakes mounted on trucks or old cars are usually better than those operated by tractors.

### Blacksmith-built Rakes

If a farmer has the necessary shop tools and is mechanically inclined, and has the time, he can build his own rake at considerable

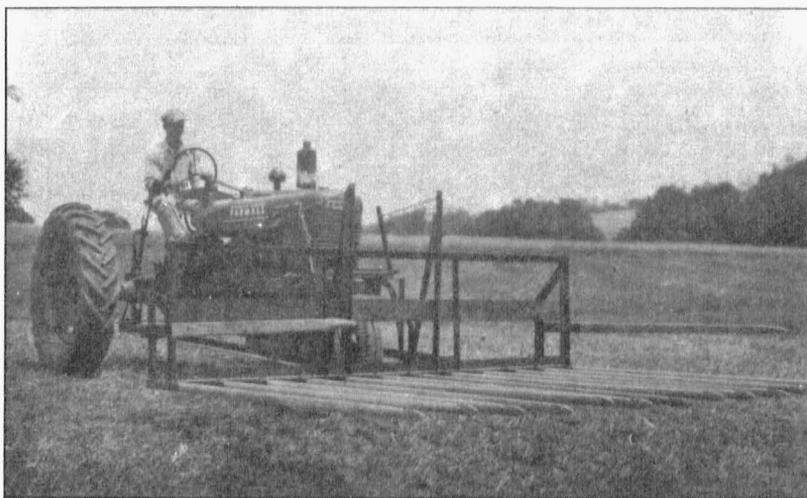


Fig. 3.—Factory-made rakes, when available, and rakes built by blacksmiths and mechanics are often more satisfactory and cheaper in the end than home-made rakes.

saving in out-of-pocket expense. Most farmers, however, do not have the required tools and equipment even if they have the time and the mechanical ability. It is therefore frequently more satisfactory and cheaper in the end, even in building a simpler type of rake, to employ a blacksmith or mechanic to at least help with the work. Blacksmiths and mechanics in Missouri have made scores of first class, highly satisfactory rakes, and farmers often find it best simply to arrange with a local mechanic to build their rakes completely.

#### Factory-made Rakes\*

It is often more satisfactory and cheaper in the end to buy a good factory-built rake than to attempt to build one at home, even with the help of a blacksmith. Factory-made rakes are generally more rugged and dependable, and over a period of years, will usually render cheaper service than a home-made rake. Therefore, before deciding to build a rake at home, it may be well to consider the purchase of a factory-built rake.

#### Getting Plans for Push Rakes

Ideas and designs for push rakes can often be secured from rakes in the community. Complete detailed plans for making and attaching rakes to various models of tractors are not generally available. Due to the differences between various makes and models of tractors, almost endless variations of a particular design would be required to make it fit any tractor. Furthermore, there is probably no one best way

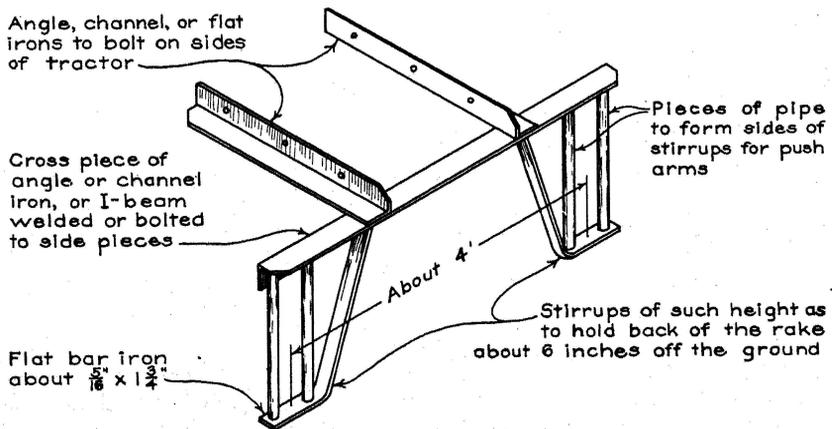


Fig. 4.—A suggested front support for push arms of a tractor push rake.

\*Although there may not be enough sweep rakes manufactured in 1944 to meet the demand, they are not now rationed (February, 1944).

to fit a rake onto any given tractor, and most builders incorporate various ideas of their own. Even so, it is possible to outline certain general principles about making and attaching a push rake to a tractor.

### Mounting a Tractor Push Rake

A good general method for mounting a tractor push rake is as follows:

(1) *Use heavy push arms to go from the back of the rake to the drawbar or other attaching points on the tractor.* These push arms may be heavy angle irons (about  $2\frac{1}{2} \times 2\frac{1}{2} \times 5/16$ ), or 4 x 4's, or heavy pipes. Hinge connections should be provided at both the rake and the tractor drawbar (or other attaching points) to allow up-and-down movement of the push arms.

(2) *Mount a heavy cross member across the front of the tractor.* This cross piece may be of angle iron, channel iron, or of heavy wood such as a 3 x 6. It may be attached to the front of the tractor with irons to be bolted to the tractor, much as cultivators are commonly attached.

(3) *Hang rigid stirrups or guides down from the cross piece to support and control side motion of the front ends of the push arms.* These hangers should support the push arms at such a height that the back of the rake will be about 6 inches off the ground, and they should allow the push arms 6 to 10 inches up-and-down play. The hangers should be well-braced to avoid side sway or movement of the rake.

### Push Rake Basket Plans

A general design for a basket for a tractor push rake is presented in Fig. 6. This rake is more strongly braced than many. It is strong enough to carry the load with the teeth lifted if this should be desired.

**Size of Push Rake.**—Rakes to be used only within fields or through wide gates may be 12 feet wide. Horse sweep rakes are commonly made this width. Rakes to be used for moving loads over farm lanes or through narrow gates, should usually be not over 10 feet wide.

**Length of Teeth.**—Teeth for ordinary tractor push rakes are commonly made 8 or 9 feet long.

**Kind of Wood for Teeth.**—Teeth should be made from straight-grained, well-seasoned, strong wood. Yellow pine, fir, oak, and ash are most commonly used. Some find it more satisfactory to buy factory-made teeth than to make them.

**Size of Teeth.**—Teeth for push rakes are commonly made of 2 x 4's with the ends tapered; or from 2 x 6's ripped on a taper, thus making one end of a tooth about  $3\frac{1}{2}$  inches wide and the other end about  $2\frac{1}{4}$  inches wide.

**Tooth Points.**—Teeth should be well-pointed. Blunt teeth are a nuisance. Metal tips are probably best, and are generally available from implement dealers.

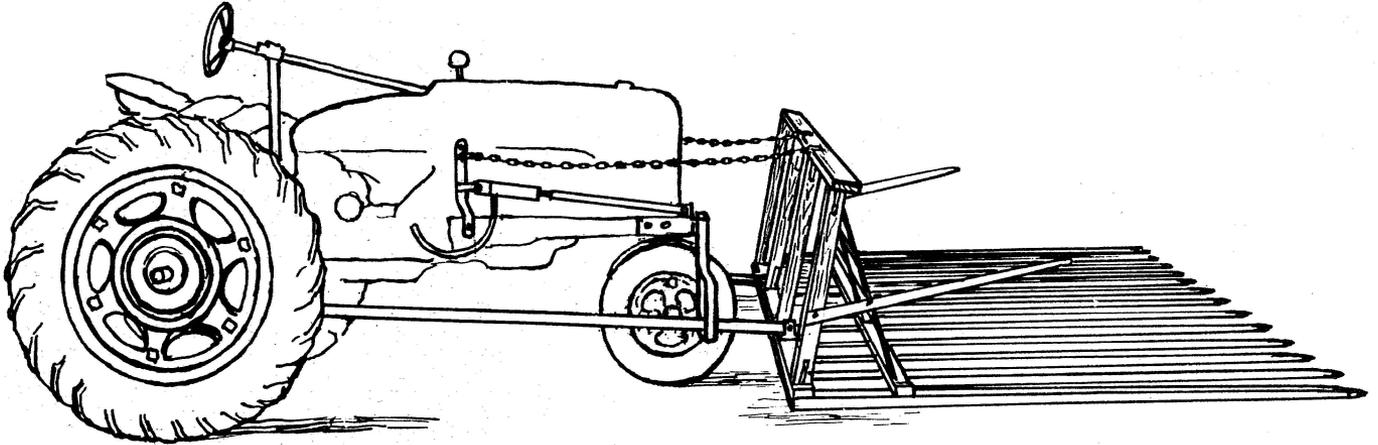


Fig. 5.—A common method of mounting tractor push rakes. The rake lift may be connected to a lever near the driver's seat or to the tractor power lift.



**Tooth Spacing.**—For ordinary hay, teeth are commonly spaced 11 to 12 inches apart, center to center. For short hay or bundles, 9 or 10 inches may be more satisfactory.

### Lifts for Push Rakes

Push rakes are frequently operated without lifts of any kind, particularly horse-operated rakes which have been converted for tractor operation. These simpler rakes without lifts are practical for the smaller jobs, particularly where it is important to keep the original cost low. It is not difficult, however, to make lifts to raise the teeth when the rake is empty, and this is usually considered worthwhile.

Such simple lifts can generally be contrived by running light chain or cable from the center of the back of the rake, possibly through or over pulleys, to a lever near the driver's seat. A general method used on several different makes of rakes is as follows: (1) Mount a cross rocker shaft at the front of the tractor, or at some other point, as just behind the engine. (2) Mount vertical arms to each end of the rocker shaft. (3) Run light chain or cable or jointed rods, from the ends of the vertical arms to two points on the back of the rake. (4) Connect the rocker shaft so it can be rocked or rotated by a lever near the driver's seat.

On late model tractors equipped with power lifts, it is frequently possible to attach the back of the rake to the power lift on the tractor.

### Carrying the Load with Push Rakes

Tractor push rakes are sometimes used to carry the load with the teeth lifted. While this may be done, if the rake is strong and a heavy-duty lift is used, it is not possible to carry as big a load as can be pushed. Also, there is some danger of overloading the tractor front wheel bearings and tires. Therefore, whenever loaded rakes are to be carried on the front wheels of a tractor, it is important that: (1) Front wheel bearings be carefully adjusted and lubricated, and (2) air pressure in front tires be increased to a suitable amount, usually 40 pounds instead of 28 for 4-ply tires.

While several cases are known where loaded rakes have been operated with the teeth raised without trouble, it should be recognized that this does overload bearings and tires and some trouble may develop.

### Converting Horse Rakes for Tractor Operation

Various methods have been used for operating old horsedrawn sweep rakes with tractors. One of the simpler methods is shown in Fig. 7. Short heavy push arms go from the back of the rake to a pivot point in front of the tractor, and a push arm extends from this pivot point to the tractor drawbar. Since there is no lift, the teeth must be left down all the time. Also, the wheels of the rake skid sidewise on short turns. While this is not an ideal arrangement, it often

represents good use of available equipment, and is practical for short hauls or small jobs.

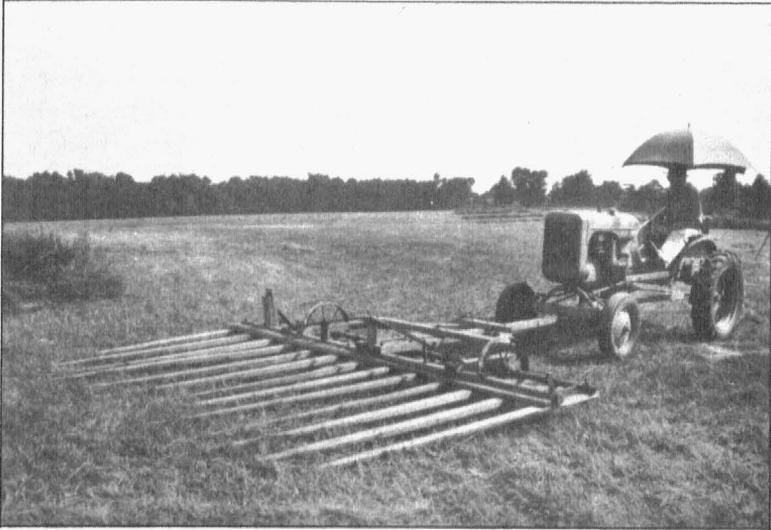


Fig. 7.—A horse type of rake used in front of a tractor. Old horse-operated rakes are also frequently mounted on the front of tractors in a manner similar to that shown in Fig. 5.

Another method of converting horse-drawn rakes is to remove the wheels and mount the rake on the front of the tractor in a manner similar to that shown in Fig. 5.

### Building a Transport Rake

Transport rakes are more complicated and difficult to build than common push rakes. If a rake has large enough capacity to make it really valuable as a transport rake, it must be large, strong, and well-braced. It must also have a heavy-duty power lift. Parts for transport rakes are commonly made from parts of discarded machines, old automobiles, etc. The details of design and construction for a rake are therefore often determined by availability of parts. It is practically always necessary to secure the service of a machinist and welder, particularly in making the lift. Plans for transport rakes are therefore rather general and suggestive at best.

Probably the best plans for building transport rakes are contained in a bulletin on "Buck Rates", published by the Ohio Agricultural Extension Service, Columbus, Ohio. This bulletin gives plans and suggestions for building transport rakes to be mounted on the rear of trucks and old cars, and also for rakes to be mounted on wheels of their own and pushed by tractors.

If it is not practical to obtain an old truck or car chassis upon which to mount a transport rake, it may be feasible to mount it on the back of a good truck and then to remove it as soon as the haying work is done.

### The Trailer Transport Rake

A trailer type of transport rake (Fig. 8) has found favor in Southwest Missouri, particularly in Barry County. The design might be described as a combination of the designs developed at Ohio State University and Michigan State College. The rake is mounted on a two-wheel trailer pulled behind the tractor. The basket is patterned after the Ohio plan and is somewhat similar to, but is larger and stronger than the basket shown in Fig. 6 of this circular. The power lift is made from the rear axle of an old automobile, after the Ohio plan, and is driven from the power take-off of the tractor.

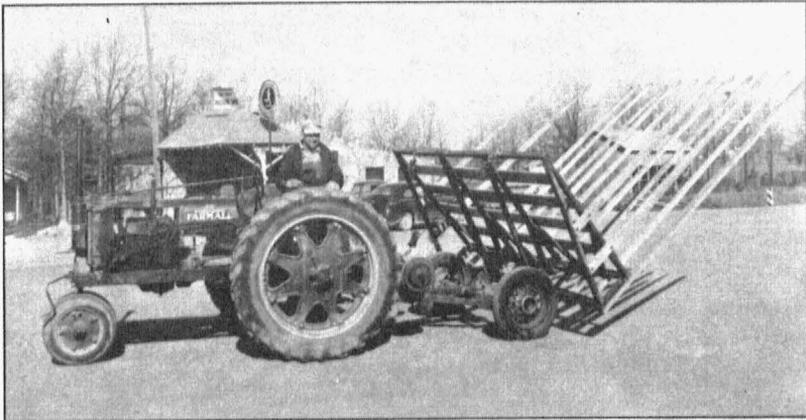


Fig. 8.—A trailer type tractor transport rake which has proven popular in Southwest Missouri.

For a rake which must be loaded at slow speed, as with a trailer type transport rake, it is desirable to have the teeth lie almost flat on the ground when loading. Otherwise, there is likely to be some difficulty in loading. Of course, the lift must raise the rake high enough to give suitable ground clearance when it is in the lifted position. (It is quite desirable that the pointed ends of the teeth be raised at least 4 feet off the ground.)

*A general farm trailer may be made easily* by removing the basket or rack from a trailer type rake and mounting a suitable bed.

While the trailer type rake is not usually as good as a rake mounted on the rear of a truck or old car, it is considered quite satisfactory, and may offer the most practical solution when a transport rake is needed and a truck or old car is not available.

### Lifts for Transport Rakes

Making a lift is one of the major problems in building a transport rake. Various devices and mechanisms have been used. Lifts of the type most generally used are made from the rear ends of old cars. Power for driving the lift, in case of rakes mounted on the rear of trucks or cars, is commonly taken from the fan belt. The power take-off on the transmission of a truck makes a very good source of power, where a truck with such equipment is available. For tractor-operated rakes, power for driving the rear-axle type of lift may come from the tractor power take-off. Mounting the rear-axle lift on the tractor drawbar, and connecting it to the tractor power take-off through a universal joint, is a very good arrangement. This method is described in considerable detail in the Ohio bulletin on buck rakes.

For the trailer type of transport rake, the rear-axle lift may be mounted on the trailer, instead of on the tractor drawbar, and driven from the tractor power take-off. When this is done, it is highly desirable that two universal joints be used in the drive, with a short telescoping section between them. One universal joint should be located as far behind the drawbar pin as the other is in front of the pin.

The power lifts on some of the later model tractors may be used to lift the rake. Many of the power lifts on tractors, however, are not strong enough to lift a good-size transport rake.

### Baskets for Transport Rakes

The basket for a transport rake may be made similar to that shown in Fig. 6, but it should be stronger and of different size. The cross members at the back of the teeth should be 3 x 4's or 4 x 4's or heavy pipe or angle iron. The rake should not be more than 10 feet wide, to better permit travel over lanes and roads. The teeth should be 12 feet long and must be strong. A 3 x 6 can be taper-ripped to make two teeth. A 3 x 12 plank can be ripped to make four teeth. Excellent plans for baskets for transport rakes are given in the Ohio bulletin.

### Rear-mounted, Direct-attached Sweep Rakes

A few sweep rakes have been built and mounted directly on the rear of tractors, no auxiliary wheels being used under the rakes. Although a few farmers who have built rakes of this type are pleased with them, they are not generally as satisfactory as other types, because they cannot carry large enough loads. The loads which they can handle are usually not more than two-thirds as large as those a push rake can handle and usually not more than half as large as the loads of a good transport rake. Such rear-mounted rakes are therefore well suited for only short hauls. And for these short hauls the simpler and cheaper push rakes are nearly always better.

As mentioned earlier in this circular, the size of loads moved by sweep rakes is often deceiving. Tests on the rear-mounted rake shown in

Fig. 9 revealed that the average load that could be loaded and carried was about 3 bales, while the same rake when mounted on the front of the tractor could push loads of from 4 to 5 bales.



Fig. 9.—Direct-attached, rear-mounted tractor rakes without wheels of their own are not generally as satisfactory as other types because they are able to carry only small loads.

Besides being able to handle only comparatively small loads, rakes mounted directly on the back of tractors have two other serious disadvantages: They are difficult to load because of the slow speed of the tractor in reverse; and they must have heavy-duty lifts which nearly always complicate the construction and increase the cost. It is true, however, that the rear-mounted rake does have some desirable features, the principal one being a clear view ahead for the driver after the rake is loaded.

In situations where a push rake is unsuitable and a transport rake is needed, it is considered much better practice to mount the rake on a 2-wheel trailer than directly on the back of a tractor. In this way a rake of suitable capacity can be obtained at practically the same cost as a direct-attached rake. The only extra parts required are an old auto axle, wheels, etc., for the trailer. The basket can be mounted to the trailer practically as easily—often more easily—than on the tractor itself. A lift which can be used on a direct-attached rake will work just as well on a trailer type of rake.

### Combination Stacker-Rakes

A few home-made combination stacker-rakes (as in Fig. 10) have been built and used quite successfully. A very large factor in the success of such a machine, however, is the mechanical ability of the builder and operator. The design of such a machine will depend upon the particular tractor to be used, and the availability of parts from discarded machines, old automobiles, etc., as well as upon the ingenuity of the builder. While a farmer with mechanical ability considerably above average could profitably build and use such a stacker-rake, most farmers could not.



Fig. 10.—A few farmers have built and successfully used stacker-rakes of this type. The success of such a machine depends largely upon the ingenuity and mechanical ability of the builder and operator.

Since a good factory-made machine is often more satisfactory and cheaper in the end, it might be well to consider the purchase of a factory-made stacker-rake before deciding to build one. It is expected that the volume of factory-made rakes will be much greater in

1944 and succeeding years than it was in 1943. They were not rationed at the time this circular was written (February, 1944).

### GENERAL SUGGESTIONS

There are two general types of sweep rakes: Push rakes and transport rakes.

Push rakes are smaller and simpler and are well suited to short hauls, as to a baler or stack in the field or to a barn adjacent to a field.

Transport rakes are better for long hauls. They should be large, strong and well-braced, and must have heavy-duty lifts. They are therefore more complicated and expensive than push rakes.

The most satisfactory transport rakes are those mounted on the rear of trucks or old cars.

If a transport rake is to be operated by a tractor, the rake should have wheels of its own. The rake may be pushed or pulled.

In order to be efficient on hauls longer than one-fourth to one-third mile, a rake should have a capacity of 700 to 1000 pounds. (Loads moved by sweep rakes often appear to be much larger than they really are.)

Factory-made rakes, when available, and rakes made by local blacksmiths and welders are often more satisfactory and cheaper in the end than home-made rakes.

Many highly satisfactory rakes have been made by blacksmiths and welders in Missouri.

Rakes mounted directly on the rear of tractors, and without auxiliary wheels, are seriously limited in the size of loads they can handle. Such rakes are therefore not efficient except for short hauls; and for short hauls, push rakes are nearly always superior.

Trailer type transport rakes on wheels of their own and pulled behind tractors have proven popular in some sections.

A few combination stacker-rakes have been built and used successfully by farmers. The mechanical ability of the builder and operator is a large factor in the success of such a machine. It is expected that a greatly increased volume of factory-made stacker-rakes will be available in 1944.