Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

Filed April 23, 1927 11 Sheets-Sheet 1

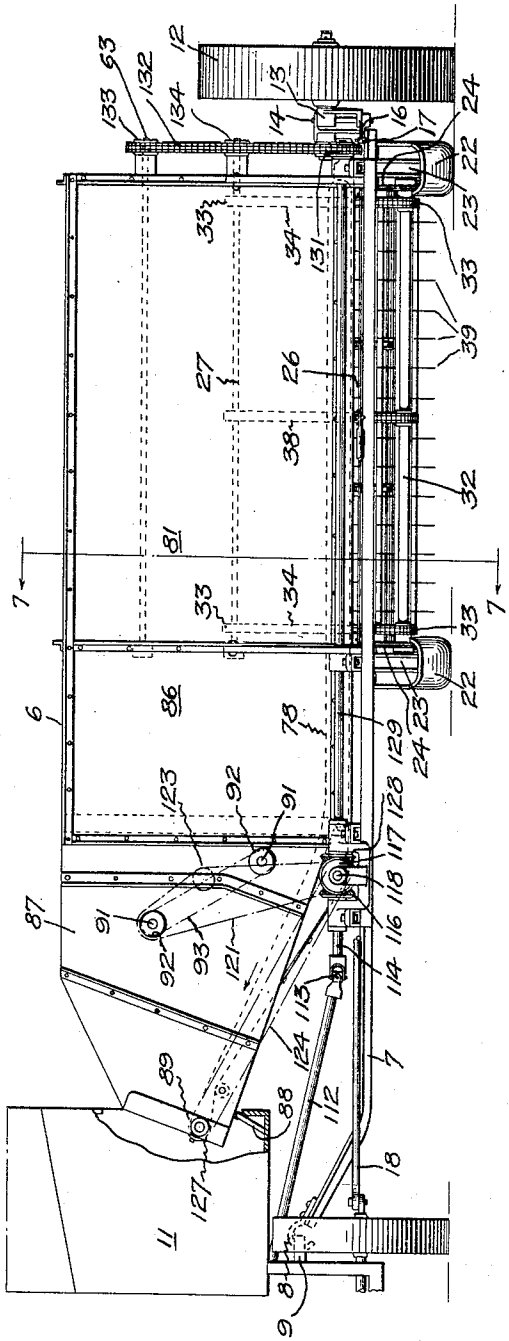


FIG. 1.

INVENTOR:
Jacob Clove
BY White, Prost & Fryer
His ATTORNEYS.

Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

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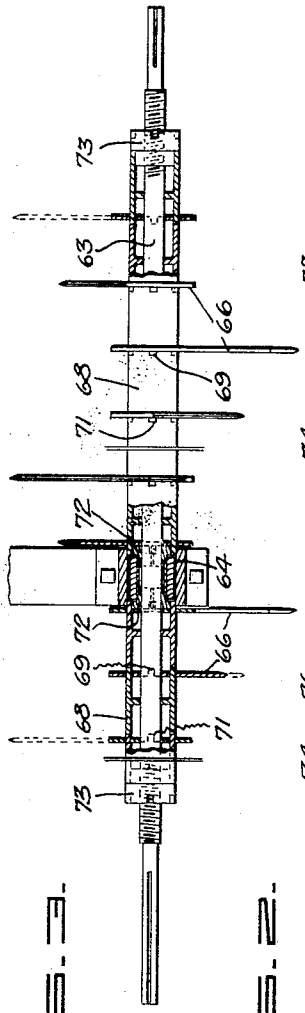


FIG. 3.

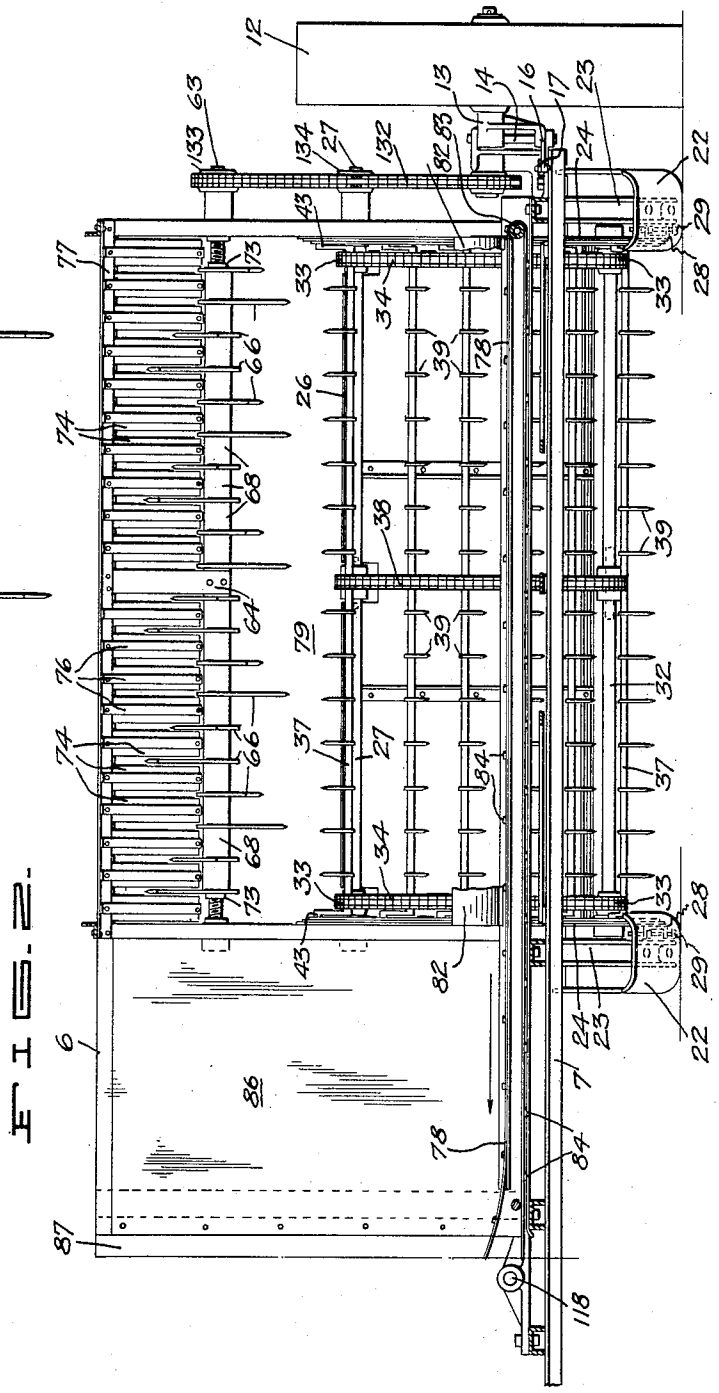


FIG. 2.

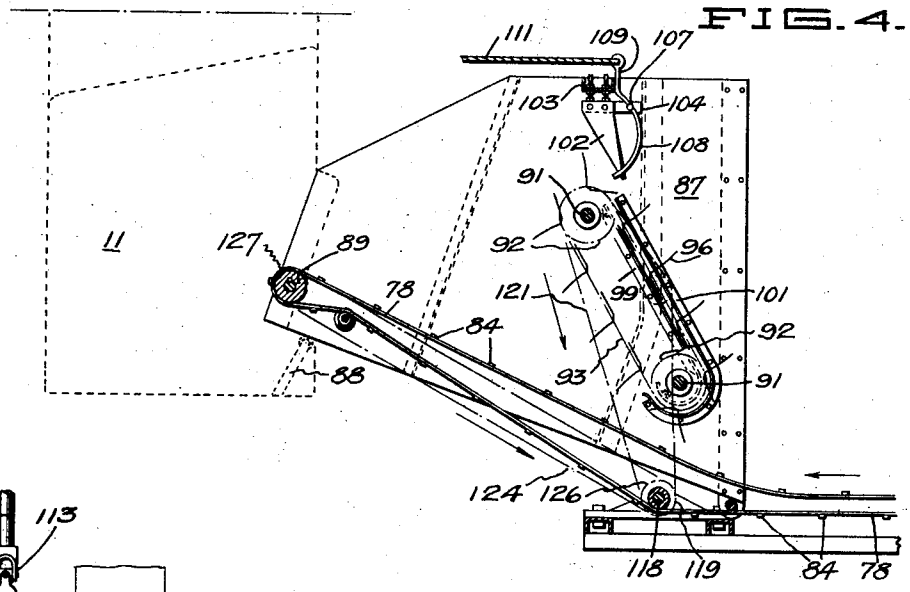
INVENTOR:
Jacob Clove
BY White, Pratt & Hayes
his ATTORNEYS.

Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

Filed April 23, 1927 11 Sheets-Sheet 3

FIG. 4.



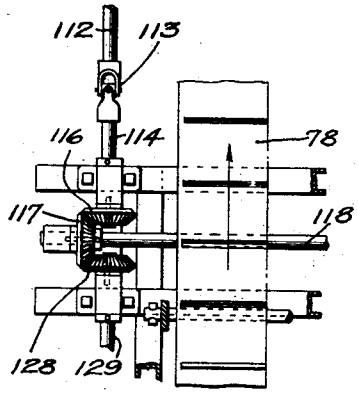
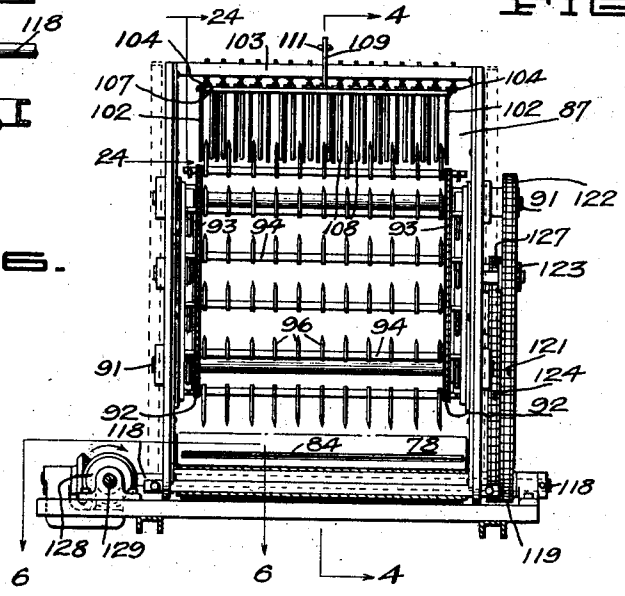


FIG. 6.

FIG. 5.

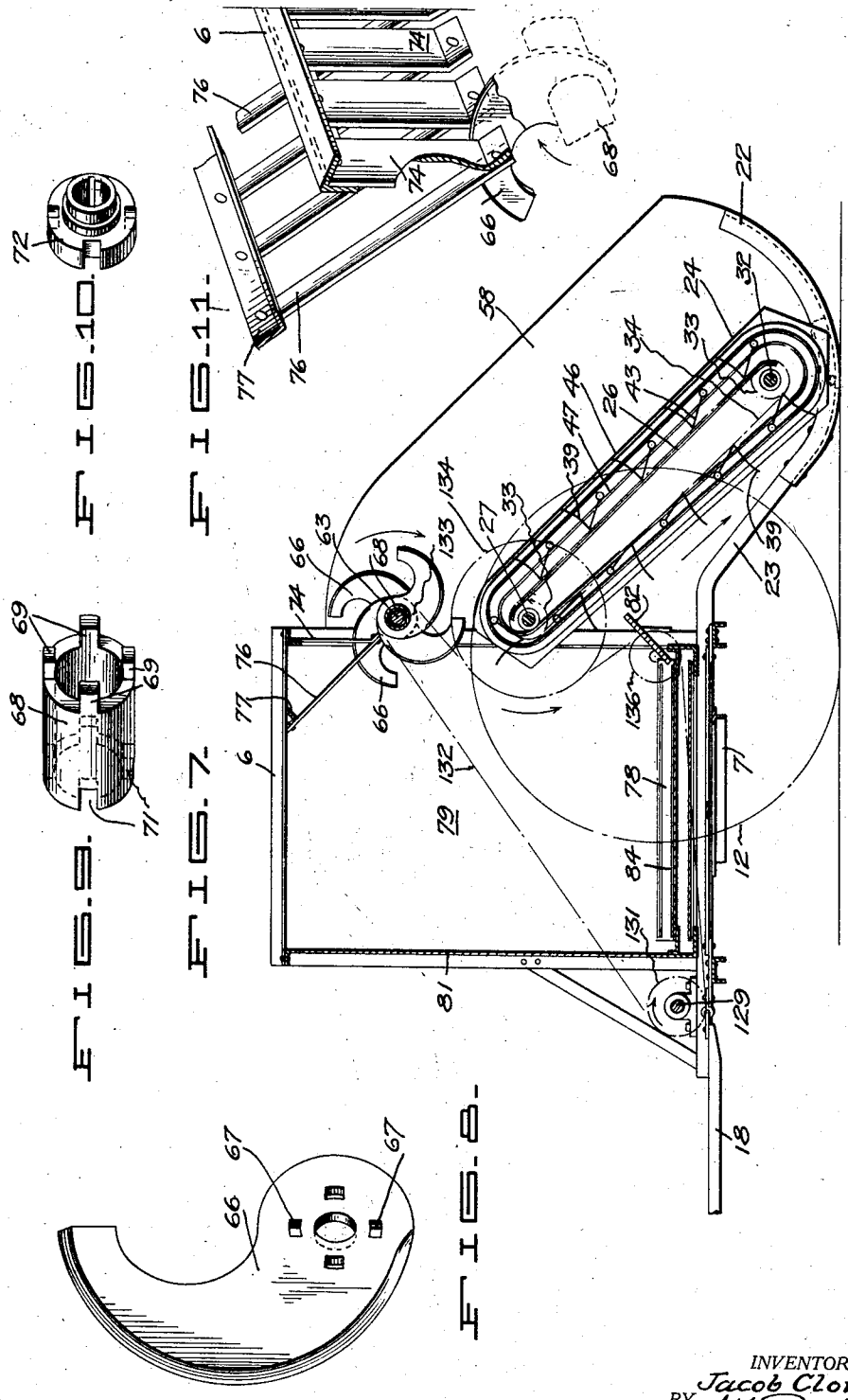


INVENTOR:
Jacob Clove
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Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

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INVENTOR:
Jacob Clove
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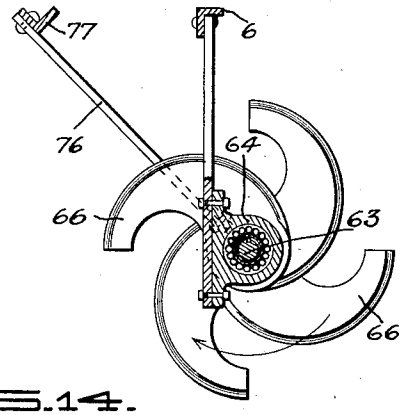


FIG. 14.

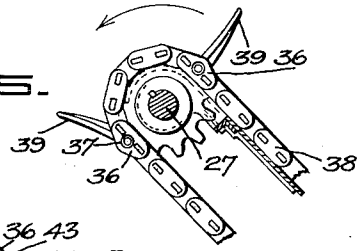


FIG. 15.

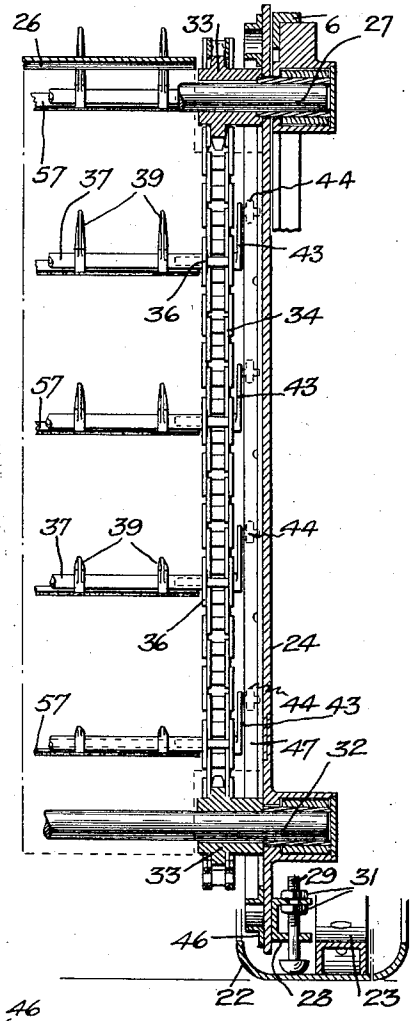


FIG. 13.

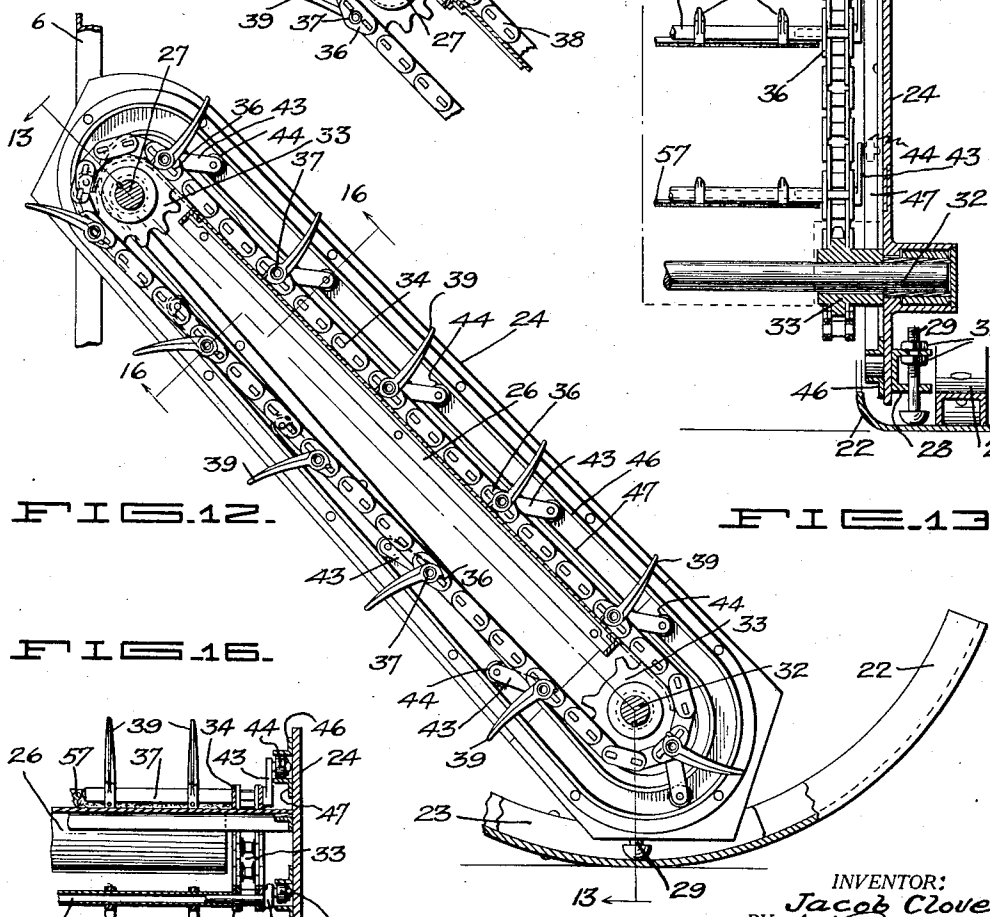


FIG. 12.

FIG. 16.

INVENTOR:
Jacob Clove
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his ATTORNEYS.

Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

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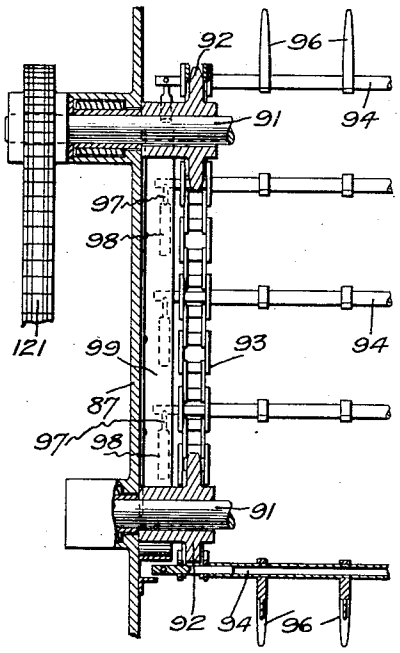


FIG. 18.

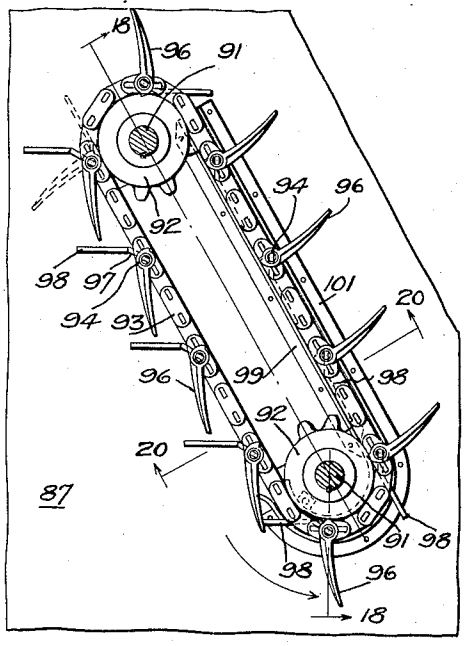


FIG. 17.

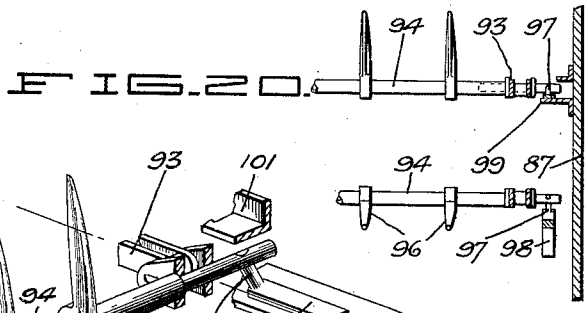
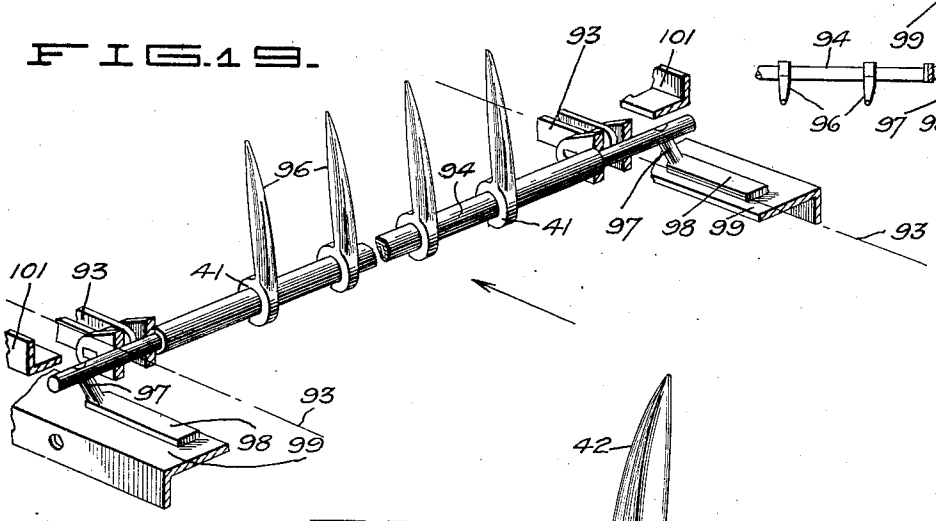


FIG. 20.

FIG. 19.



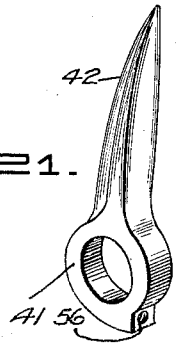


FIG. 21.

INVENTOR:
Jacob Clove
BY White Post & Fryer
his ATTORNEYS.

Dec. 20, 1932. J. CLOVE 1,891,748

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FIG. 22.

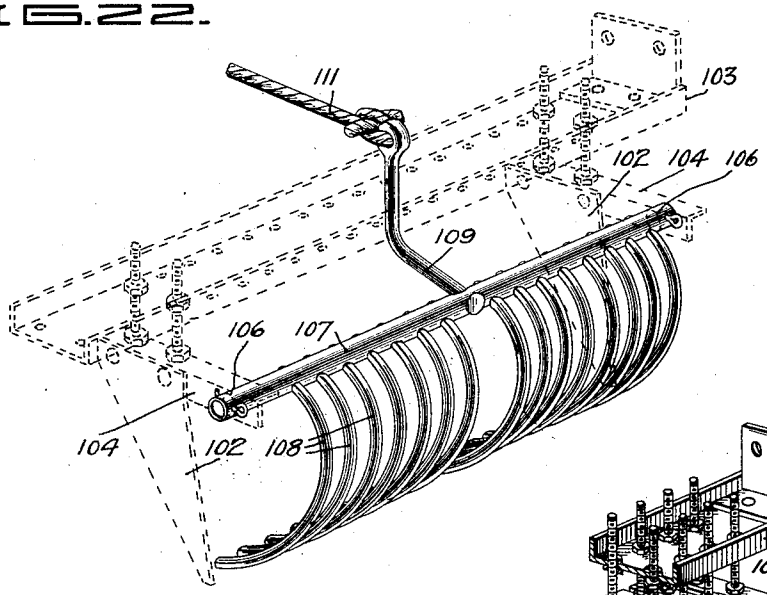


FIG. 23.

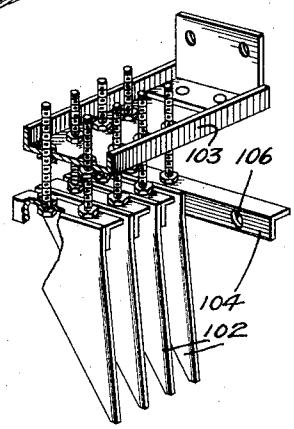
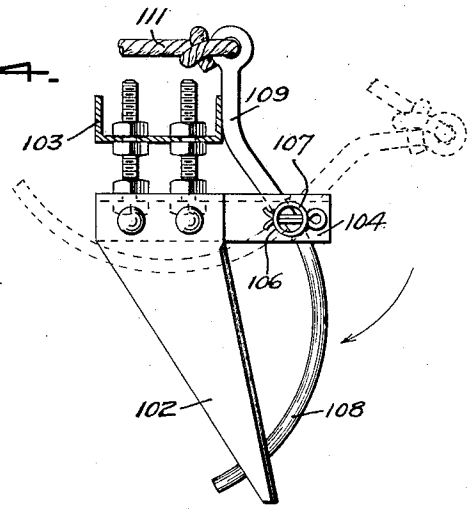


FIG. 24.



INVENTOR:
Jacob Clove
BY White, Dust & Fryer
his ATTORNEYS.

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FIG. 29.

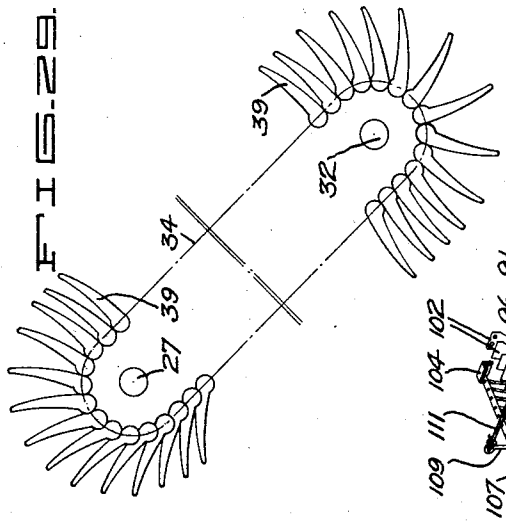


FIG. 30.

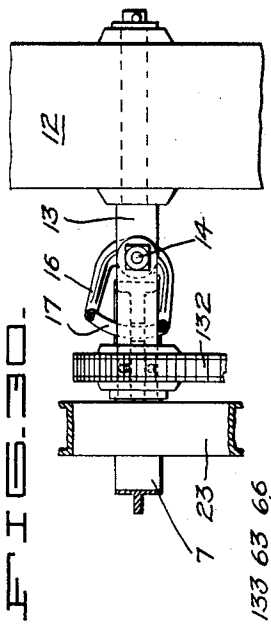
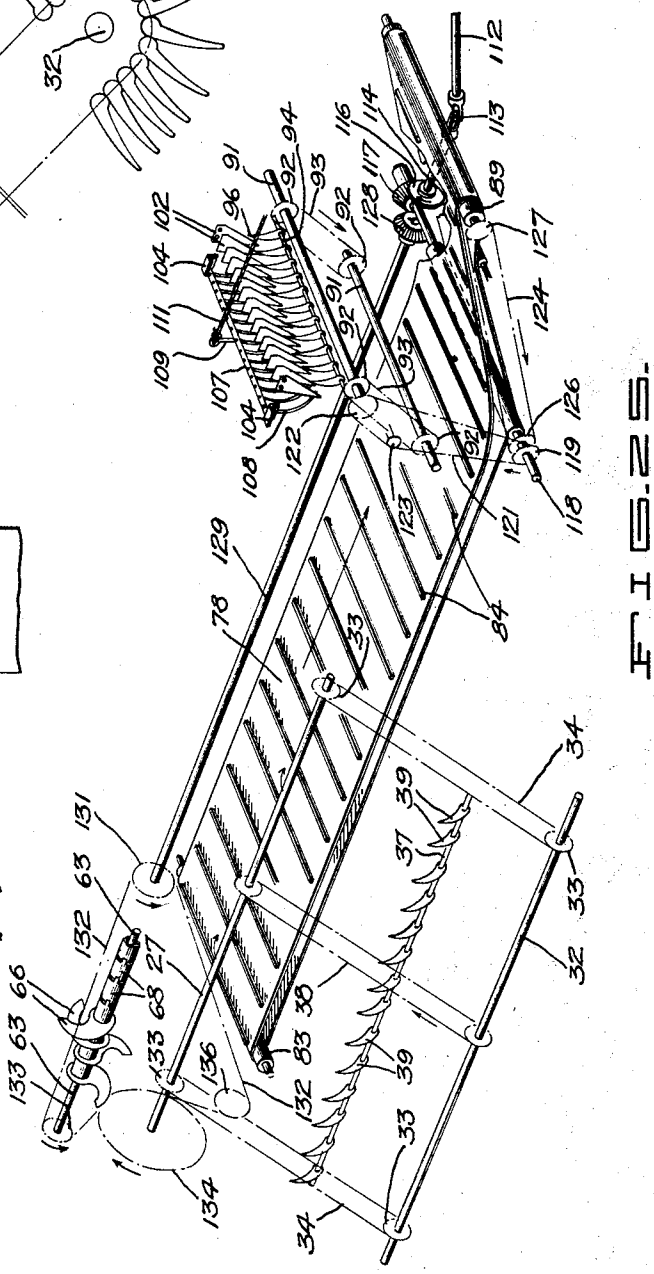


FIG. 25.



INVENTOR:
Jacob Clove
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his ATTORNEYS.

Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

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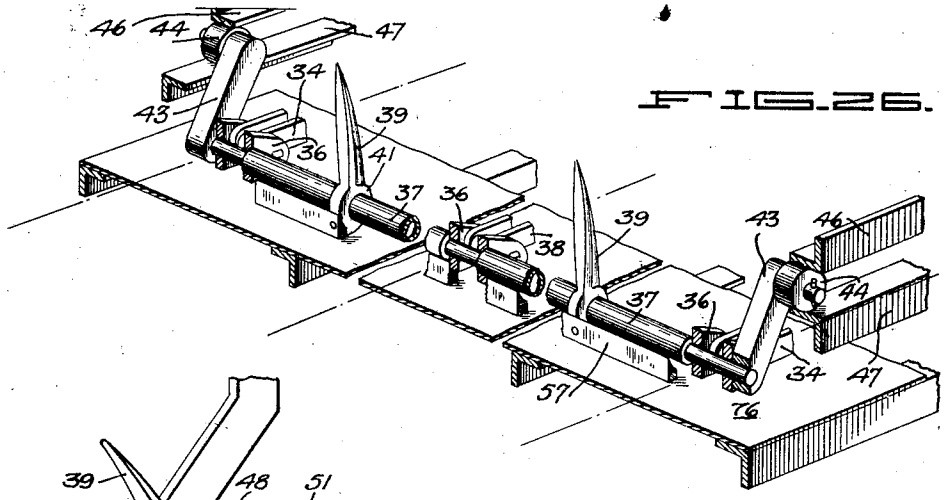


FIG. 26.

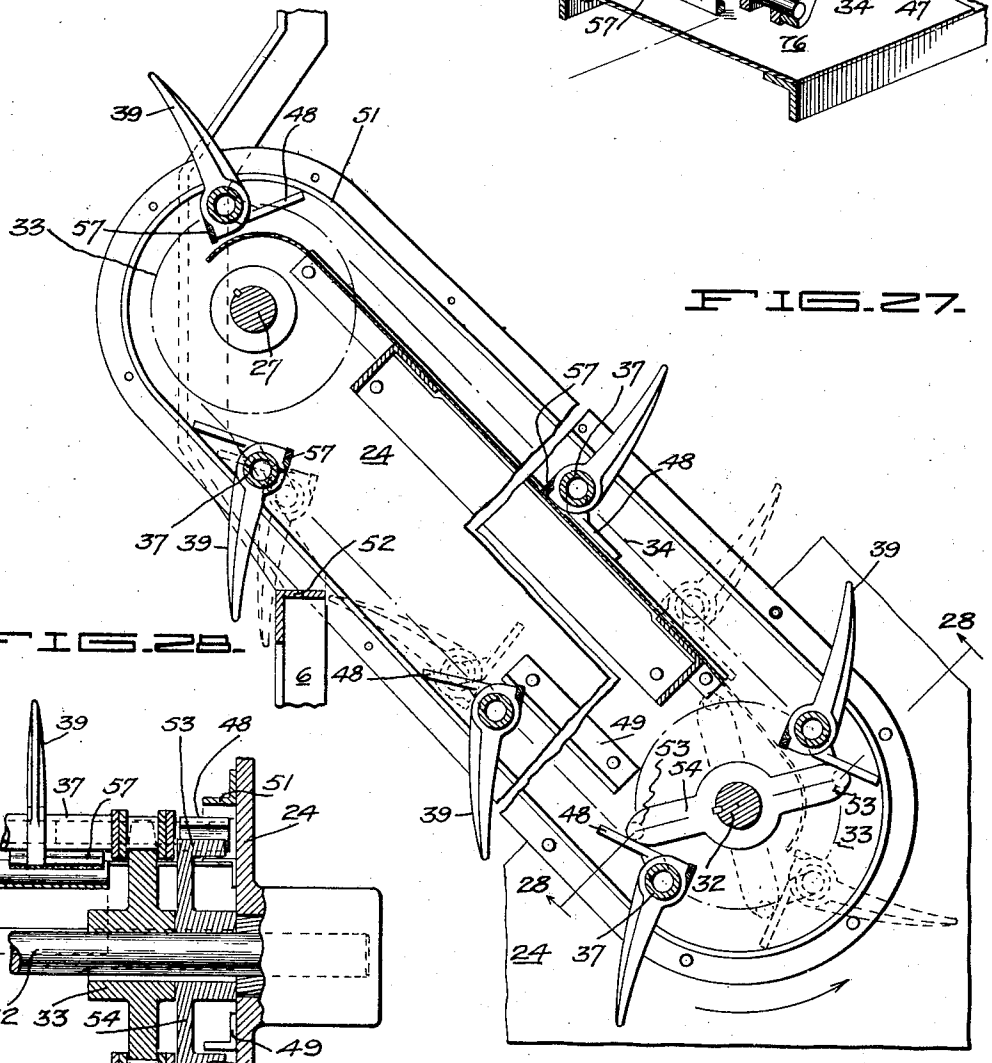


FIG. 27.

FIG. 28.

INVENTOR:
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Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

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FIG. 31.

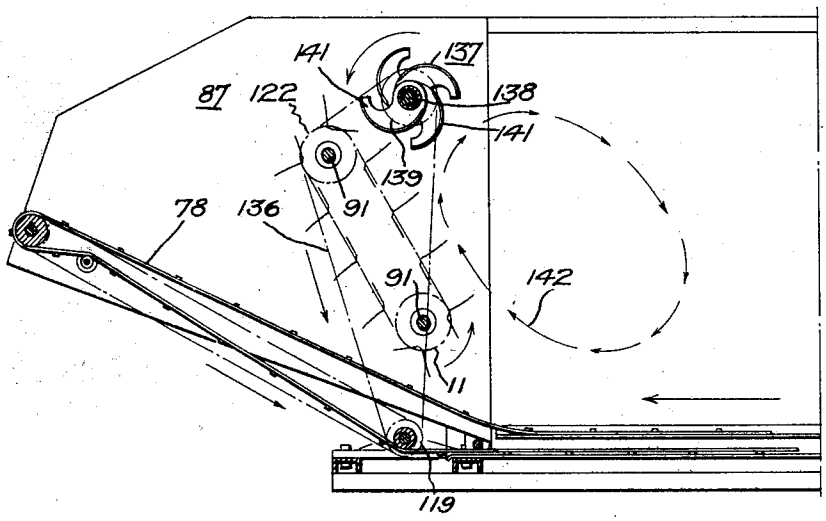
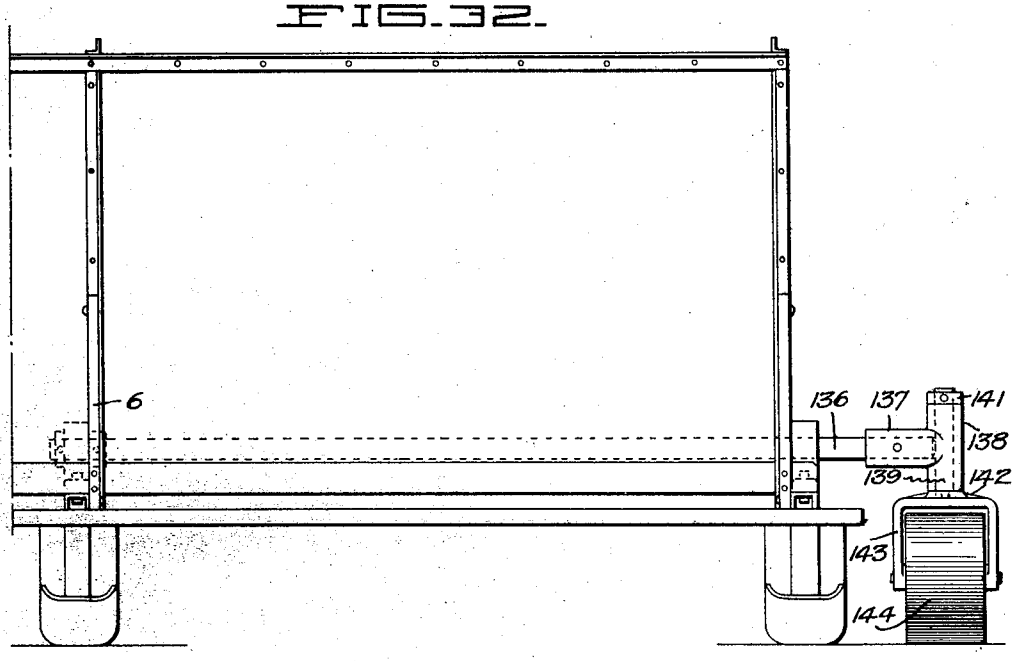


FIG. 32.



INVENTOR:
Jacob Clove
BY White Frost & Fryer
his ATTORNEYS.

Dec. 20, 1932. J. CLOVE 1,891,748

PICK-UP

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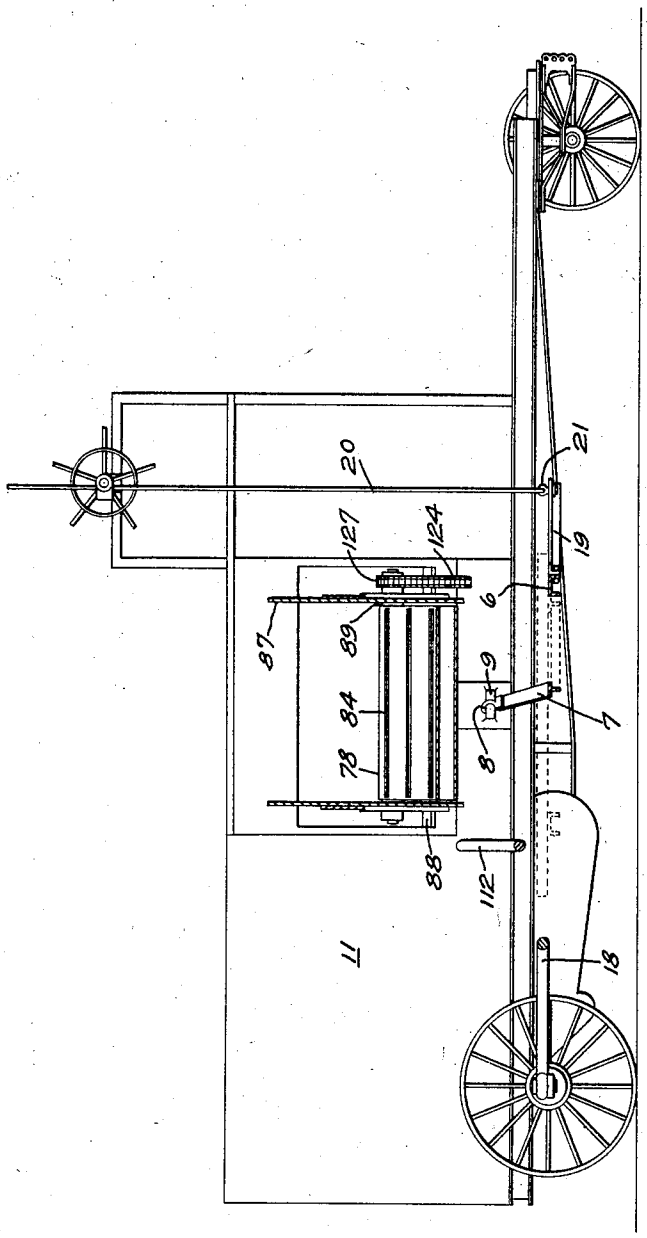


FIG. 13.

INVENTOR:
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his ATTORNEYS.

Patented Dec. 20, 1932 1,891,748

UNITED STATES PATENT OFFICE

JACOB CLOVE, OF STOCKTON, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CATERPILLAR TRACTOR CO., OF SAN LEANDRO, CALIFORNIA, A CORPORATION OF CALIFORNIA

PICK-UP

Application filed April 23, 1927. Serial No. 186,138.

My invention relates to harvesting machines and relates especially to machines for gathering grain which has been tied into bundles and for delivering the gathered grain to be threshed. Under certain conditions of grain growing, the standing grain when ripened, instead of being cut and immediately threshed is cut and tied into sheaves or bundles which are stacked in shocks and left in the field for an extended period. It is generally the custom at present to thresh the bundles of grain by situating the threshing machine at a convenient point in the field and then having laborers with pitchforks load conveyances with the individual bundles from the shocks. The bundles are delivered to the threshing machine where the ties binding them are cut and the grain is released and threshed. This scheme involves a large amount of manual labor and is fundamentally slow and inefficient. This method of handling is also wasteful of grain as a considerable quantity of the ripe kernels is shaken from the straw and lost upon the ground.

The most modern machines for harvesting grain are built with the primary intention of having them driven over the field of standing grain to cut the grain and thresh it as they travel. Such machines are usually termed combined harvesters as they include a header portion which cuts the grain and delivers it to a separator portion which threshes the kernels from the straw. In most instances, the header and the separator are made in two easily separable units for facilitating transportation. While combined harvesters are very advantageous for use when conditions permit immediate threshing of the standing gain, they are of no value with grain which has previously been cut and tied into bundles.

It is therefore an object of my invention to provide means which can be attached to the separator portion of a combined harvester and will operate in conjunction therewith to gather tied bundles of grain.

Another object of my invention is to provide means for delivering to a threshing machine, bundles of grain which have been piled in a shock.

A further object of my invention is to provide means for gathering from the field, irregular quantities of grain and continuously feeding a practically constant amount of grain to a threshing machine.

An additional object of my invention is to provide means for gathering grain from the field and preparing it for treatment in a threshing machine.

A further object of my invention is to provide means for gathering bundles of grain preferably piled in a shock which will substantially duplicate the action of a manually operated pitchfork.

The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description where I shall outline in full that form of the pick-up of my invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of pick-up embodying my invention, but it is to be understood that I do not limit myself to such form since the invention as set forth in the claims may be embodied in a plurality of forms.

In the drawings:

Fig. 1 is a rear elevation of the pick-up of my invention attached to the separator portion of a combined harvester, a part of the separator being shown.

Fig. 2 is a rear view of a portion of the machine of my invention, with parts removed to disclose the draper, the pick-up conveyor and the band cutter.

Fig. 3 shows in detail the shaft carrying the band cutters, portions being disclosed in section on a diametral plane.

Fig. 4 shows the arrangement of the portion of the pick-up which cooperates directly with the separator portion of the combined harvester and shows particularly the feeder arranged in the housing pivoted to the framework.

Fig. 5 is an end elevation of the housing as shown in Fig. 4, the view being taken in the direction of the arrow in Fig. 4.

Fig. 6 is a plan of a portion of the driving mechanism, as indicated by the line 6—6 of Fig. 5.

Fig. 7 is a cross section of the pick-up, the plane of section being taken on line 7—7 of Fig. 1.

Fig. 8 shows in perspective one of the knives comprised in the band cutter.

Fig. 9 shows in perspective one of the spacers comprised in the band cutter.

Fig. 10 is a perspective of a bearing spacer for the band cutter.

Fig. 11 shows in perspective a portion of the framework adjacent the band cutter.

Fig. 12 is a cross section of the pick-up conveyor, the plane of section being indicated by the line 12—12 of Fig. 2.

Fig. 13 is a section of the pick-up conveyor, the plane of section being indicated by the line 13—13 of Fig. 12.

Fig. 14 shows the mounting for the band cutter, portions being indicated in a cross section on the line 14—14 of Fig. 2.

Fig. 15 is a fragmentary view disclosing the discharge end of the pick-up conveyor.

Fig. 16 is a cross section of the pick-up conveyor, the plane of section being indicated by line 16—16 of Fig. 12.

Fig. 17 shows the feeder in cross section, the plane of section being on line 17—17 of Fig. 5.

Fig. 18 is likewise a cross section of a portion of the feeder, the plane of section, however, being taken on line 18—18 of Fig. 17.

Fig. 19 shows portions of the feeder in perspective.

Fig. 20 is a cross section of the feeder, the plane of section being indicated by the line 20—20 of Fig. 17.

Fig. 21 shows in perspective one of the tangs as used on the feeder and on the pick-up conveyor.

Fig. 22 discloses in perspective the comb installed with the knives associated with the feeder.

Fig. 23 is a view showing in perspective the means of mounting the knives adjacent the feeder, portions being broken away.

Fig. 24 is a section on the line 24—24 of Fig. 5 showing in elevation portions of the stationary knives of the feeder and the comb.

Fig. 25 is a diagrammatic perspective of the principal elements of the pick-up of my invention, disclosing especially the driving connections.

Fig. 26 is a perspective showing a means for moving the tangs relative to the chains on the pick-up conveyor.

Fig. 27 is a section similar to Fig. 12 but disclosing a modified form of means for providing relative movement between the chains and the tangs on the pick-up conveyor.

Fig. 28 is a cross section of the modification disclosed in Fig. 27, the plane of section being on line 28—28 of Fig. 27.

Fig. 29 is a diagrammatic motion study of various successive positions of the tangs on the pick-up conveyor at the loading and at the discharge ends.

Fig. 30 is a plan of the mounting of the caster wheel supporting the header.

Fig. 31 is a longitudinal section in a vertical plane of a modified form of feeder construction.

Fig. 32 shows a modified form of caster wheel at the end of the pick-up.

Fig. 33 shows a manner of pivotally moving the pick-up about an axis.

The pick-up of my invention preferably comprises a carriage adapted to be driven over a field in which tied bundles of grain are disposed and which is provided with means for gathering the bundles and preparing the grain for further treatment in a threshing machine.

Although I describe my invention in connection with tied bundles of grain which are preferably arranged in shocks, it is also very useful with grain which is not tied and is lying broadcast on the field or has been gathered into windrows on the ground. It is by no means confined to use with grains such as wheat but is advantageously employed with beans and peas or similar vegetation as well. A variety of uses under a variety of conditions will occur to a user of my machine. I have chosen one environment in which to describe my pick-up but such an environment is merely typical and is not to be considered as the only one in which my machine is advantageously operated.

While it can be made as an integral part of a combined harvester, I preferably embody my invention as a separable portion to replace the header of an ordinary combined harvester and to be attached conveniently to the separator portion thereof. The separator portion ordinarily includes suitable threshing machinery and carries also a source of power, such as a gasoline engine, for driving the various threshing mechanisms. In one form of my invention, the pick-up includes a carriage or framework 6 mounted on an axle 7 and which is preferably fabricated of suitable channels and angles of iron. The axle is provided at one end with a hook 8 engaging an eye 9 furnished on the separator 11. From this universal connection to the separator 11, the axle 7 extends laterally and at its remote end rotatably engages a ground contacting wheel 12. As shown particularly in Figs. 1 and 30 the wheel 12 is joined to the axle 7 by a knuckle 13 journaled on a pivot pin 14. It is then free to rotate about a substantially vertical axis at the end of the axle 7. The reason for pivoting the wheel to permit caster action is to aid the pick-up in making relatively sharp turns and in order to constrain the wheel against pivoting when the pick-up is traveling straight ahead, a yoke 16 is affixed to the knuckle 13 and is

provided with an arcuate strap 17 overlying the axle 7. The yoke 16 by coming into contact with the axle limits the relative pivotal movement between the wheel and the axle and is preferably designed to permit the wheel to assume its pivoted position only when the pick-up is turning to the right, as is almost invariably the case when a sharp turn is to be made.

A push pole 18 is attached at one end to the body of the separator 11 and at the other end is joined to the pick-up. The principal driving stresses are transmitted thru the push pole which, together with the axle 7, provides a sufficiently rigid driving connection. The pick-up is pivoted about axle 7 with respect to the separator 11. As shown in Figure 33, a beam 19 extends forward from the framework 6 and is provided with an eyelet 21 for attachment to the Jacob staff 20 of the conventional separator. As is well known, an operator on the separator raises and lowers the Jacob staff at will, as by means of a hand wheel, and the connection with the beam 19 permits him to rock the framework 6 about axle 7. The pick-up is substantially balanced on the axle 7 so that little effort is required to effect the pivotal movement. To aid in supporting the framework 6, a pair of runners 22 are provided. The runners are preferably arcuate concave metal shoes and are rigidly attached to extensions 23 projecting forward from the framework 6. The runners 22 contact with the surface of the ground and normally assist in supporting the framework. By suitable manipulation of the Jacob staff on the separator 11, the beam 19 can be lifted and the framework including the runners 22, can be entirely raised from the ground. This is a valuable feature when the machine is used in a field in which obstacles, such as rocks or stumps, are encountered.

On the leading side of the framework 6, and disposed longitudinally thereof are means for engaging bundles of grain arranged in a shock and for conveying them into the pick-up. A frame including parallel end boards 24 and a center board 26 perpendicular to the end boards is pivotally connected to the framework 6. The connection comprises an axle or shaft 27 rotatably mounted in the framework 6 and extending parallel with the center board 26 thruout the length of the frame. Rotatably journaled on the shaft 27 are the end boards 24 so that the entire frame is free to pivot with respect to the framework 6. The frame is positioned with respect to the framework by adjustable connections at the lower, leading edge. Each end board 24 is the support for a bracket 28 thru which a hemispherically headed screw 29 is inserted. Jam nuts 31 adjustably position the screw on each of the runners 22 and by suitably adjusting the screw, the relative position of the frame with respect to the runners can be regulated. By this means the leading edge of the frame can be given any height above the ground that it is desired, and the degree of inclination of the entire frame can be changed at will.

The means on the frame for engaging the bundles of grain preferably include a conveyor. This pick-up conveyor in one embodiment includes the shaft 27 and a second axle or shaft 32 also journaled in the end boards 24 and extending parallel to shaft 27. At both ends of the two shafts, suitable sprockets 33 are mounted and are engaged by a pair of chains 34 arranged to run in a plane substantially parallel to the plane of the end boards 34 and to operate in a circuit encompassing the center board 26. The two chains 34 are of standard construction with the exception that at intervals thruout their length they are provided with irregular links 36. The two chains are arranged with their irregular links in alinement to receive bars 37 arranged parallel to shaft 27 and 32 and journaled in the irregular links. If the proportions of the device are such that the pick-up conveyor is relatively long, I preferably install a center chain 38 engaging sprockets on shafts 27 and 32 and also provided with links 36 in which the central portions of bars 37 are journaled.

Each of the bars 37 is provided with a plurality of tangs 39 the contour of which is preferably as shown in Fig. 21. In one form of construction, they comprise a boss 41 apertured to fit a bar 37 and provided with a pointed projection 42 disposed substantially perpendicular to the axis of the aperture. They are slipped over the bars to their respective spaced positions and are welded or otherwise secured in place. Preferably I aline the tangs 39 on the various bars 37 in a vertical plane and also dispose them all with the same angular or polar relationship to their respective bars.

I have found that if a pick-up conveyor as so far described is operated, assuming that the bars 37 are immovably fixed in the irregular links 36, the tangs 39 in rounding the lower, leading edge of the frame, do not properly engage the individual bundles of grain forming the shock into which the apparatus is driven. The tangs are disposed substantially radially on the shaft 32 and exert a force in a tangential direction on the standing bundle of grain. This motion is often as effective to upset the bundle of grain without engaging it as it is to afford a firm engagement by which the bundle can be conveyed into the pick-up. I have found in studying the motion which a pitchfork describes when it is being manually operated, that the tines of the fork are usually substantially horizontal to the ground just before they engage the bundle of grain and are then

pointed upwardly somewhat and lifted into the bundle. They gain a firm hold and the bundle is securely held on the fork until it is discharged by the operator. I have therefore devised means for substantially reproducing the action of the tines of a manually operated pitchfork with the tangs 39 on the bars 37.

Instead of immovably affixing the bars 37 in the links 36 of the chains, I provide a predetermined relative movement between the bars and the chains to afford a suitable path of motion for the tangs as they round the leading edge of the frame to engage the standing bundles of tied grain. In one modification of this means, the bars 37 are freely journaled in the chain links 36 and at each extreme end are provided with cranks 43. The cranks are supplied with rollers 44 which pass between two angles 46 and 47 arranged on the end boards 24 to form tracks. As can be seen in Fig. 12, the tracks while following generally the circuit of the chains 34 deviate therefrom in certain predetermined amounts. Preferably, the crank arms 43 are offset angularly on the bars 37 with respect to the plane of the tangs 39 and are disposed in cooperation with the tracks so that relative rotational movement is afforded between the bars 37 and the links 36 during certain portions of the circuit of the chains. There is, in practice, a certain amount of rotational movement between the individual links of the chain, but this movement is not sufficient to interfere appreciably with the proper relative motion between the bars 37 and the links. While the bars and the chain move with respect to the frame substantially synchronously at all times, the projecting portions 42 of the tangs are constrained by the cranks 43 to a periodic asynchronous motion with respect to the frame. The contour of the angles 46 and 47 proximate the shaft 32 is such that the tangs rounding the leading edge of the frame are first moved substantially parallel to the ground and as they advance to their position of greatest forward projection, they are inclined upwardly somewhat to engage the tied bundles of standing grain. The grain bundle is thereby firmly impaled on the tangs and is carried on the pick-up conveyor to the upper, discharge end. With the shafts 27 and 32 suitably driven, and the bars 37 of the conveyor operating at the proper speed, the carriage can be driven into a shock of grain comprising a plurality of tied bundles and the tangs 30 will impale the individual bundles and lift them onto the conveyor, raising them to the upper, discharge end.

A variant means of producing relative rotation between the bars holding the tangs and the chains 34 is disclosed in Fig. 27. In this modification, the major portions of the structure are as before but the bars 37 carry cranks 48 not provided, usually, with rollers. The cranks operate between guides 49 and 51 arranged on the end board 24 and on the upper run of the conveyor are normally maintained in contact with the inner guides 49 by the weight of the bundles of grain they carry. As they round the upper, discharge end of the conveyor, the tangs 39 release the bundles of grain and the cranks 48 tend to move outwardly and bear against the outer guide 51. This relationship is maintained until the tangs, on their downward movement, strike against an angle 52 forming part of the framework 6. They drag over the angle 52 where any adhering grain is forced off and then depend freely, as the inner guide 49 is interrupted. As they approach the sprocket 33 on the lower shaft 32, the cranks 48 are contacted by one of a plurality of suitably spaced pins 53 secured to a spider 54 mounted on and rotatable in unison with the shaft 32. The timing arrangement of the spider and the chain 34 is such that contact between the pins 53 and the cranks 48 rotates the bars 37 in the chain and gives the requisite relative movement between the tangs and the chain. Further movement of the bars 37 around the sprocket 33 finally advances the tangs to such a point that the cranks 48 again come into engagement with the inner guide 49 under the influence of the load they carry and the pins 53 are disengaged and continue their rotation. A substantial duplicate of the motion obtained with the track as disclosed in Fig. 12 is obtained with the mechanism of Fig. 27. From the preceding description, it is seen that the pick-up comprises an endless inclined conveyor having an upper conveying reach and an under return reach, with pick-up and discharge turns at the ends of said reaches. At the discharge turn, material is discharged onto a draper 78 positioned below the discharge end of the conveyor.

The conveying of the bundles of grain from the ground and over the pick-up conveyor is apt to dislodge kernels of grain from the straw, as is the case with manual gathering of the bundles. In my device, kernels which become dislodged fall upon the center board 26. The inclination of the frame is often considerable, and the kernels normally gravitate to the ground so I have provided means for sweeping them up on the center board to be discharged with the bundles of grain. Each tang 39 preferably includes on the boss 41, a projection 56 which is drilled and tapped. Since all of the tangs 39 on each bar 37 are preferably alined in a single, radial plane the projections 56 are also in alinement and a strip 57 of flexible material, such as leather, is preferably extended across the entire width of the center board and is suitably attached to the projections 56. The flexible material contacts with the center board and,

as the bars 37 ascend, the kernels of grain which have become dislodged and have fallen on the center board are swept upwardly to the discharge end. The end boards 24 are preferably provided with end shields 58 which are conveniently metal plates to protect the pick-up conveyor from cross winds which would disturb the grain thereon.

The bundles of grain are arranged with the straw parallel and the heads at one end and are usually tied by means of a circumferential band. Before the grain can be threshed, it is necessary that the band be severed to release the grain. I have therefore provided a band cutter adjacent the upper, discharge end of the pick-up conveyor. The band cutter comprises a rotatable shaft 63 journaled at its ends in the framework 6 and preferably provided with a central supporting journal 64 also secured to the framework. The shaft 63 is located preferably just above the upper, discharge end of the pick-up conveyor and lies parallel with shaft 27. At intervals on the shaft 63, knives 66 are disposed. These knives are usually of a crescent shape as disclosed in Fig. 8. They are centrally apertured to be slipped over shaft 63 and are provided with a plurality of arcuate apertures 67 concentric with the central aperture. They are spaced on the shaft by means of interposed collars 68 each of which has at one end a plurality of projections 69 to pass through the apertures 67 and at the other end a plurality of cooperating recesses 71 to receive similar projections 69 on the preceded collar. The knives are preferably alternated on the shaft 63 by the collars 68 and are thus suitably spaced apart. They are also angularly spaced, usually at 90 degree intervals. At the end of the shaft 63 and also adjacent the center bearing 64, collars 72 of the type shown in Fig. 10 are provided. After the shaft 63 is loaded with collars and knives, suitable nuts 73 are screwed on opposite ends and tightly clamp the entire assembly in position. Preferably, the spacing between the individual knives is such that there is practically no possibility of any of the ties binding the bundles of grain passing thru the band cutter without being severed.

The direction of rotation of shaft 63 is usually opposite to the direction of rotation of shaft 27 and such direction of rotation might tend to cause the knives 66 to discharge released grain between the band cutter and the upper portion of the framework 6. To obviate this possibility I preferably provide a plurality of fingers 74 secured at their upper ends to the framework 6 and depending between the individual knives 66. The width of the fingers 74 is such as to afford ample running clearance for the knives but to prevent the escape of any considerable amount of grain. The fingers 74 are supported at their lower ends by means of braces 76 extending to an angle 77 forming a portion of the framework 6. If any grain should pass through the fingers 74, it normally would fall on the center board 26 and would again be carried over the discharge end of the pick-up conveyor.

The bundles of grain which have had their ties severed by being passed adjacent the band cutter fall onto a draper 78 disposed in substantially a horizontal plane at the lower portion of the framework 6. The framework preferably is arranged to enclose a chamber 79 along the bottom of which the draper runs. The chamber 79 is generally closed or partially closed by sheet metal walls 81 at one side and by a baffle 82 at the other side to prevent the discharge of grain with the downwardly moving pick-up conveyor. The draper 78 is of the usual kind and preferably comprises a flexible belt passing over a roller 83 journaled at one end of the framework 6 and which is provided with a plurality of transverse cleats 84 at spaced intervals on its exposed side. The upper run of the draper 78 preferably moves toward the left in Fig. 1 and carries the grain deposited thereon by the pick-up conveyor toward the left. Inasmuch as the pick-up conveyor extends longitudinally for a considerable distance along the draper, the draper receives along a considerable portion of its length bundles of grain which have just had their ties cut. The pick-up in moving over a field encounters a shock of grain comprising a plurality of bundles and picks them all up and deposits them on the draper. It then progresses for a considerable interval without encountering another shock of grain. It therefore occurs that the draper is rapidly loaded with a number of just released bundles of wheat and then operates for a period without receiving any bundles whatsoever. This irregular feeding is not well suited to a threshing machine in which the rate of feed should be substantially constant to obtain the best results. An accumulating chamber 86 is therefore provided. This accumulating chamber is enclosed by the framework 6 and by the sides 81 and is a portion of the length of the draper 78 onto which the pick-up conveyor does not discharge. In the accumulating chamber the grain which has been released can pile up and accumulate to be discharged at substantially a constant rate despite the irregularity and intermittency with which it is charged.

Forming part of the framework 6 and pivotally attached thereto is a housing 87 secured at one end just beneath the draper 78 and resting at the other end on the jigger board 88 of the separator. The housing is mounted in this manner to permit differences in movement between the separator and the pick-up. Adjacent the point of attachment of the housing, the draper 78 changes its sub-

stantially horizontal course and is inclined upwardly to pass about a roller 89 journaled in the housing 87. Some grain is carried thru the accumulating chamber up the inclined portion of the draper and is discharged over the roller 89 into suitable threshing machinery contained in the separator. A large proportion of the grain carried by the draper banks up and accumulates in the accumulation chamber 86 and I usually provide means for feeding it from the accumulating chamber into the separator. Journaled in the sides of the housing 87 are a pair of parallel shafts 91 which are also substantially parallel with the surface of the draper 78. On each of these shafts a pair of sprockets 92 are mounted, each of the sprockets being disposed adjacent the side walls of chamber 87. A pair of chains 93 engage the sprockets 92 and are provided at regular intervals with links in which a plurality of transverse bars 94 are journaled. These bars are preferably mutually parallel and are preferably equally spaced. Each of them preferably carries a plurality of tangs 96 which can be of the same type as tags 39 as shown in Fig. 21. The tangs are preferably arranged in file on the various bars 94 and are equally spaced along the length of the bars.

At the shafts 91 are rotated, the tangs engage the banked grain in the accumulating chamber and carry it upwardly and throw it over the upper end of the feeder into the separator. Grain which falls onto the draper is carried into the separator in the usual manner. If the bars 94 were rigidly affixed in the chains, they might tend to buckle the chain as they assumed the load. There are provided means for taking the twisting strain imposed on the bars 94 by loads on the tangs 96. Each of the bars 94 is freely journaled in the two chains and cannot transmit any twisting strains. Levers 97 are affixed to each end of the bars 94 and include trailers 98 which are adapted to slide on a guide 99 secured to the wall of the housing 87. The guides 99 follow closely the circuit of the chains and as load is imposed upon the tangs 96 the trailers 98 bear against the guides 99 and prevent twisting strains from being transmitted to the chains. An outer guide 101 is also provided on the walls of the housing 87 and provides, with the guide 99, a channel between which the trailers 98 pass. The bars are constrained in motion and prevent interference with proper operation of the chains by undue movement of the tangs.

The rate at which grain is fed by the feeder from the accumulating chamber toward the separator is preferably constant and in order to assist in regulating the amount of grain carried by the feeder I provide a plurality of depending plates 102. These plates are preferably parallel to each other and are mounted on a transverse channel 103 which is secured to the walls of the housing 87 and is preferably parallel to the upper shaft 91. The plates are adjustable to be moved toward or away from the upper shaft 91 and are preferably spaced to be located intermediate the paths of the various tangs 94. They assist in regulating the rate at which grain is fed and prevent an excess of grain from passing to the separator. It may very infrequently happen that a tied bundle of grain passes the band cutter adjacent the pick-up conveyor without having its tie severed. Such a bundle of grain would be passed along by the draper and would be conveyed by the feeder to the plates 102. Preferably the leading edge of each of the plates 102 is sharpened to form a knife edge, and the plates become in effect knives. If the feeder carries a tied bundle across the knives 102, the band is severed and the grain is finally released. The plates 102 therefore serve the double purpose of assisting in regulating the rate of feed and also in insuring that no uncut bundles are passed to the separator.

It may occasionally happen that the accumulating chamber becomes excessively loaded so that the feeder tends to cause material to bank against the plates 102. This condition is not particularly disadvantageous and the machine operates in a satisfactory manner despite it, but I have provided a comb, as shown in Fig. 22, which operates to clear the plates 102 of accumulated matter. Two of the angles 104 to which the plates 102 are preferably attached are extended and are provided with apertures 106 in which a rod 107 is journaled. The rod is preferably kept from endwise movement in the angles 104 either by suitable cotter pins or by bearing against the side walls of the housing 87. At intervals along the rod, tines 108 are affixed. The tines can conveniently be passed thru diametral apertures in the rod and be riveted in place. The tines are of arcuate shape and are spaced to move intermediate the plates 102. An arm 109 is also affixed to the rod 107 and is provided with a cord 111 extending to a suitable point of operation. During the normal functioning of the machine, the grain passing over the top of the feeder bears against the tines 108 and causes them to move upwardly into the position shown in dotted lines in Fig. 24. They therefore offer substantially no obstruction to the passage of grain, but when it is desired to clear the plates or knives 102 of adhering matter, the cord 111 is pulled, rotating the rod 107 in its journals and moving the tines 108 to their full line position as shown in Fig. 24. Adhering matter is thereby combed from the plates 102 and clogging is obviated.

All of the various moving parts of the pick-up preferably derive their motion from the power source on the separator portion of the combined harvester. A drive shaft 112 ex-

tends to a convenient connection with such source of power and drives through a universal joint 113, which permits variation in the angularity of the two shafts, a second shaft 114 carrying a bevel gear 116. The bevel gear meshes with a comparable bevel gear 117 secured to a transverse shaft 118. At the opposite end of the shaft 118, a sprocket 119 engages a chain 121 passing around a sprocket 122 affixed to the upper shaft 91 of the feeder. An idler 123 also engages chain 121 to afford a uniform degree of tension. The upper shaft 91 rotates the lower shaft 91 by means of the pair of chains and the relative sizes of the gears and sprockets are such that a proper linear speed is given to the tangs 94. The draper is driven by means of a chain 124 engaging a sprocket 126 on shaft 118 and also engaging a sprocket 127 on rollers 89. Opposite bevel gear 116 and also meshing with bevel gear 117 is a bevel pinion 128 affixed to one end of a longitudinal shaft 129 parallel to one side of the draper and journaled in the framework 6. The shaft 129 extends to the remote end of the machine at which point it carries a sprocket 131. A sprocket chain 132 engages the sprocket 131 and passes over a sprocket wheel 133 affixed to the end of shaft 63 which drives the band cutter. The chain 132 then passes over a comparatively large sprocket 134 secured to the upper shaft 27 of the pick-up conveyor. Rotation of shaft 27 drives, by means of the chains 34, all of the bars 37 and tangs 39 included in the pick-up conveyor. Chain 132 then passes over an idler 136 which imparts to it the requisite tension and also provides an increased angular contact with sprocket 134, from which it passes to sprocket 131 thereby completing its circuit. The proportions of the sprockets at the remote end of the machine are such that the proper relative speeds are afforded to the band cutter and the pick-up conveyor.

Under certain conditions of operation and particularly with grain having very long straw, I preferably use the form of feeder shown in Fig. 31. In this modification the framework 6 carries the draper 78 which is also supported in the pivotally attached housing 87. Shafts 91 are journalled in the housing and are comprised in the feeder which in all respects is similar to the feeder particularly disclosed in Fig. 4. A chain 136 engages suitable sprockets 119 and 122 to impart the requisite drive to the feeder. As so far described, the mechanism in the housing 87 is like the previously described modification. I preferably omit the relatively stationary plates 102 and their associated parts which act as a regulator for the feeding of grain and install a retarder 137.

A shaft 138 is suitably journaled in the housing 87 and is rotated by an attached sprocket 139 engaging the chain 136. On the shaft 138 a plurality of knives 141 are secured. These knives are preferably like the one shown in Fig. 8 and are placed upon shaft 138 with intervening collars and in an angular relationship to provide an assembly similar to the band cutter. Upon the movement of the feeder, the retarder 137 is revolved in the same direction and aids in regulating the rate at which grain is fed. The revolving retarder also has the function of cutting the ties or bands on any bundles of grain which may happen to pass the band cutter uncut and particularly assists in aiding the collected grain in the accumulating chamber to roll in the path of the arrow 142 in Fig. 31. The grain is thus fed at a substantially constant rate and is kept moving with the draper and with the feeder and does not tend to pack and form an obstruction.

While the caster wheel arrangement shown in Fig. 30 is well adapted to a variety of circumstances, there are certain conditions which require a greater freedom of wheel movement and I consequently have developed the wheel mounting disclosed in Fig. 32. To the framework 6, a beam 136 is fastened. The beam is preferably fabricated of a tube such as an iron pipe and is rigidly anchored in place. One end of the horizontally disposed tube extends from the frame and carries a yoke 137 at its extremity. A horizontal tubular member of the yoke encompasses the end of the tube and is fixed in place. A vertical tubular member 138 is united to the horizontal member and forms a journal for a vertical shaft 139. Rotational movement of the shaft in the member 138 is freely permitted but vertical or axial displacement is prohibited by collars 141 and 142. Preferably the lower collar 142 and the shaft 139 are formed integrally with a fork 143 carrying a ground contacting wheel 144. The axis of rotation of the wheel is not coplanar with the pivotal axis of shaft 139 and the wheel acts as a caster and permits the header to turn sharply in all directions.

With the pick-up of my invention attached to the separator portion of a combined harvester, the entire machine can be propelled over a field in which bundles of grain are piled in shocks, and will pick up the individual bundles of grain with a motion similar to that of a man using a pitchfork. The bundles of grain are conveyed upwardly to the pick-up conveyor through the band cutter at which point the ties binding them are severed and the released grain falls onto the draper. The draper carries the released grain transversely of the header to the accumulating chamber where the grain piles up and gathers. A proportion of the grain is carried by the separator directly to the harvester and the remainder is engaged by the feeder which lifts it and carries it past the feed regulating plates and then dis-

charges it to the separator. Any bundles which are still intact are released by the sharpened edges of knives adjacent the feeder and the released grain is passed to the separator. A substantially constant rate of feed to the separator is maintained in which the grain is threshed in the usual manner. My machine is easily maneuverable about a field as it is provided with a caster wheel which permits sharp turns to be made. It also can be pivoted bodily about its supporting axle by manipulating a suitable control on the separator, and the height at which the tangs engage the bundles of grain can be regulated by an adjustable support connecting the pick-up conveyor and the runners. My machine is therefore applicable to a variety of conditions, is adapted to be attached to the separator portion of a combined harvester, can be moved with the separator over a field to gather grain which has been tied in bundles and piled in shocks, and will convey the grain in a proper manner to a threshing machine.

I claim:

1. A pick-up comprising a framework, a draper on said framework, means for discharging cut bundles of grain onto one end of said draper, means for further handling said grain adjacent the other end of said draper, and an accumulating chamber intermediate the ends of said draper.

2. A pick-up comprising a frame, a draper on said frame, a feeder adjacent the discharge end of said draper, and an accumulating chamber on said frame intermediate the ends of said draper.

3. A pick-up comprising a framework, a draper on said framework, means for discharging cut bundles of grain along a predetermined portion of the length of said draper, and a feeder on said framework spaced from said predetermined portion to provide an accumulating chamber.

4. A pick-up comprising a framework, a draper on said framework, said draper having an initial substantially level portion and a final inclined portion, a feeder on said framework and located adjacent the junction of said level and said inclined portions, means for discharging cut bundles of grain on said level portion, and an accumulating chamber on said level portion.

5. A pick-up comprising a framework, parallel shafts journaled in said framework, sprockets on said shafts, chains engaging said sprockets, bars parallel to said shafts and journaled in said chains, tangs on said bars, lever arms on said bars, and a plurality of tracks on said framework for limiting the movement of said lever arms.

6. A pick-up comprising a framework, a draper on said framework, a pair of shafts on said framework and disposed parallel to the surface of said draper, sprockets on said shafts, chains engaging said sprockets, a plurality of bars on said chains, said bars being disposed parallel to the surface of said draper, tangs affixed to said bars perpendicularly, and means for disposing said bars with respect to said chains to facilitate the picking up of grain from said draper by said tangs.

7. A pick-up comprising conveyor means movable to transport material, means for discharging material onto said conveyor means, and means cooperatively positioned with respect to said conveyor means for preventing material in excess of an approximately predetermined quantity from being discharged by said conveyor means.

8. A pick-up comprising a conveyor means normally receiving material intermittently, and means cooperatively positioned with respect to said conveyor means for retarding material to preserve an approximately constant discharge from the conveyor means.

9. A pick-up comprising a first conveyor means movable over a circuit to transport material, said conveyor means normally receiving the material in irregular quantities, a second conveyor means movable over a circuit adjacent to the first conveyor means, the circuit of said second conveyor means lying adjacent to the first conveyor means so that the second conveyor means is effective to convey material in excess of an approximately predetermined quantity back onto the first conveyor.

10. In a pick-up, means movable to engage material on a field, to transport the engaged material, and to discharge the material; and means movable with the material engaging means to collect material becoming disengaged from the engaging means during transportation, said collecting means discharging collected material with the transported material.

11. In a pick-up, a center board, a plurality of grain engaging means movable over the center board, said center board cooperating with the grain engaging means to transport engaged grain, and means for collecting grain disengaged from said engaging means.

12. In a pick-up, a center board, a plurality of grain engaging means movable over the center board, said center board cooperating with the grain engaging means to transport engaged grain, and means movable with the grain engaging means for sweeping the center board to collect and transport grain disengaged from the engaging means.

13. A pick-up comprising a pair of parallel end boards, a center board affixed to said end boards and extending perpendicular thereto, a bar adapted to be moved over said center board and substantially parallel thereto, and means impelled by said bar for sweeping said center board.

14. A pick-up comprising a pair of end

boards, a plane center board extending therebetween, a plurality of bars adapted to move in a plane parallel to the plane of said center board, and means on said bars for sweeping said center board.

15. A pick-up comprising a pair of end boards, a pair of chains parallel to said end boards, a center board extending between said chains and affixed to said end boards, a plurality of bars attached to said chains and adapted to be moved in a plane parallel to said center board, and means secured to said bars for sweeping said center board.

16. A pick-up comprising a pair of end boards, a center board extending between said end boards, a pair of chains, one of said chains running adjacent each of said end boards, bars adapted to be propelled in a plane parallel to said center board, a plurality of tangs on said bars, and flexible strips attached to said tangs for sweeping said center board.

17. A pick-up comprising an inclined frame adapted to be moved over the ground, a plurality of tangs on said frame adapted to engage a bundle of grain initially when proximate the leading edge of said frame, a runner adapted to contact the surface of the ground, and means adjustably securing the runner to said frame to vary the height at which the tangs engage the bundle of grain.

18. A pick-up comprising a framework, a runner secured to said framework and adapted to contact the surface of the ground, a frame adapted to move in unison with said framework, and means adjustable for height connecting said frame to said runner.

19. A pick-up comprising an axle supported to move over the ground, a framework pivotally mounted on said axle, an inclined frame attached to said framework, tangs at the leading edge of said frame adapted to engage a bundle of grain, a runner secured to said framework and adapted to contact the surface of the ground, means for moving said frame relative to said runner to adjust the height of said tangs, and means for pivoting said framework about said axle to raise said runner from the ground.

20. A pick-up comprising a movable conveyor, a second conveyor, material engaging means on said second conveyor, and means for moving said second conveyor so that material is engaged by the engaging means and is transported to the movable conveyor.

21. A pick-up for a threshing machine, comprising a carriage, a conveyor mechanism mounted on said carriage and adapted to transport material from the field to the threshing machine, and means to connect said carriage to the threshing machine to operatively connect said conveyor means with said threshing machine.

22. A pick-up for a threshing machine, comprising an axle having a ground support at one end and a connection to the threshing machine at the other end, a frame mounted on said axle, conveyor means mounted on said frame, and means to angularly adjust said frame with respect to the axis of said axle to enable said conveyor means to pick up material from the field and transport material to the threshing machine.

23. A pick-up for a threshing machine, comprising an axle, a conveyor means substantially balanced on said axle, and means to connect said axle to said threshing machine to enable said conveyor means to be moved over a field with said threshing machine and to be adjusted with respect to the field to enable said conveyor means to pick up material from the field and transport material to the threshing machine.

24. A feeder comprising a draper adapted to receive irregular quantities of uniformly disposed grain, and means for retarding certain portions of said grain whereby a substantially regular quantity of grain is discharged from said draper.

25. A feeder comprising conveying means for transporting grain, and means adjacent said conveyor means for retarding the conveyance of grain in excess of a predetermined amount on a portion of said conveyor.

26. A feeder comprising means adapted to receive and to convey grain, and control means for regulating the quantity of grain discharged from said conveyor means to a substantially predetermined quantity.

27. A feeder comprising conveyor means for conveying grain, means adjacent to said conveyor means for regulating the volume of grain conveyed past said regulating means by said conveyor means, and adjusting means for varying said regulating means to vary the volume of grain conveyed by said conveyor means past said regulating means.

28. A feeder comprising conveyor means for conveying grain, means adjacent to said conveyor means for regulating the volume of grain conveyed past said regulating means by said conveyor means, and adjusting means for controlling the volume of grain conveyed by the conveyor means past said regulating means.

29. A feeder comprising means for conveying grain, a member rotatably mounted adjacent said conveyor means, and grain engaging means projecting from said member to retard the passage of grain on said conveyor means.

30. A feeder comprising conveyor means adapted to receive quantities of grain intermittently whereby said conveyor is unevenly loaded, and regulating means for retarding grain so that the discharge from the conveyor is substantially uniform.

31. A feeder comprising means for conveying grain, said grain being distributed on

said conveying means in substantially uneven quantities, means for retarding grain in excess of a selected quantity, and means for varying said selected quantity.

32. A feeder comprising grain engaging means, means for supporting said grain engaging means for rotation, means for conveying grain adjacent to said engaging means, and means for moving both of said means so that said grain engaging means retard passage of grain on said grain conveying means.

33. A feeder comprising grain engaging means, means for supporting said grain engaging means, means for conveying grain adjacent to said engaging means, and means for moving said grain engaging means relative to said conveying means to retard passage of grain on said grain conveying means.

34. A feeder, comprising a conveyor moving in one direction, and a regulator moving in the opposite direction.

35. A feeder, comprising a conveyor, a regulator, and means to drive said regulator positively at uniform speed.

36. A feeder, comprising a conveyor, a regulator, and means to positively drive said regulator at constant speed and in a direction opposite to the direction of movement of said conveyor.

37. A feeder for a threshing machine having a discharge control.

38. In a pick-up, an endless conveyor having an upper conveying reach, an under return reach, a pick-up turn, and a discharge turn; a plurality of tangs movably mounted on said conveyor; and means for effecting movement of said tangs relative to the conveyor at the pick-up turn.

39. In a pick-up, an endless conveyor having an upper conveying reach, an under return reach, a pick-up turn, and a discharge turn; a plurality of tangs movably mounted on said conveyor; and means for effecting movement of said tangs relative to the conveyor at the pick-up turn and for maintaining the tangs stationary with respect to the conveyor on the conveying reach.

40. In a pick-up, an endless conveyor having a conveying reach, a return reach, a pick-up turn, and a discharge turn; a plurality of tangs movably mounted on said conveyor; and means for effecting movement of said tangs relative to the conveyor at the pick-up and discharge turns, and for maintaining the tangs stationary with respect to the conveyor on the conveying reach.

41. In a pick-up, an inclined endless conveyor having an upper conveying reach, an under return reach, a pick-up turn, and a discharge turn; a plurality of tangs movably mounted on said conveyor; means for effecting movement of said tangs relative to the conveyor at the pick-up turn and for maintaining the tangs stationary with respect to the conveyor on the conveying reach; and a draper positioned below the discharge turn to receive material discharged from the conveyor.

42. A mobile combined harvester-thresher having a pick-up mechanism for gathering material from the ground as the thresher is moved over the ground, said pick-up mechanism comprising an endless series of tangs adapted to move adjacent the ground for collecting material from the ground, and means for moving said tangs in a closed path.

43. A mobile combined harvester-thresher having a pick-up mechanism for gathering material from the ground as the thresher is moved over the ground, said pick-up mechanism comprising an endless series of tangs adapted to move adjacent the ground for collecting material from the ground, means for moving said tangs in a closed path, and means for imparting to said tangs during such movement an additional angular movement when the tangs are adjacent the ground.

44. A mobile combined harvester-thresher having a pick-up mechanism for gathering material from the ground as the thresher is moved over the ground, said pick-up mechanism comprising an endless conveyor having an upper conveying reach, an under return reach, a pick-up turn, and a discharge turn, a plurality of tangs movably mounted on said conveyor, and means for effecting movement of said tangs relative to the conveyor at the pick-up turn.

45. A mobile combined harvester-thresher machine having a draper extending transversely to the direction of movement of the machine for conveying material to the thresher, and a pick-up mechanism mounted in advance of the draper for gathering material from the ground as the machine is moved over the ground and for conveying material to the draper, said pick-up mechanism comprising an endless series of tangs adapted to move adjacent the ground for collecting material from the ground, and means for moving said tangs in a closed path.

46. A mobile combined harvester-thresher machine having a draper extending transversely to the direction of movement of the machine for conveying material to the thresher, and a pick-up mechanism mounted in advance of the draper for gathering material from the ground as the thresher is moved over the ground and for conveying material to the draper, said pick-up mechanism comprising an endless series of tangs adapted to move adjacent the ground for collecting material from the ground, means for moving said tangs in a closed path, and means for imparting to said tangs during such movement an additional angular movement when the tangs are adjacent the ground.

47. A mobile combined harvester-thresher machine having a draper extending transversely to the direction of movement of the

machine for conveying material to the thresher, and a pick-up mechanism mounted in advance of the draper for gathering material from the ground as the thresher is moved over the ground and for conveying material to the draper, said pick-up mechanism comprising an endless conveyor having an upper conveying reach, an under return reach, a pick-up turn, and a discharge turn, a plurality of tangs movably mounted on said conveyor, and means for effecting movement of said tangs relative to the conveyor at the pick-up turn.

48. A mobile combined harvester-thresher machine having a thresher unit, a header unit detachably connected to the thresher unit and extending transversely to the direction of movement of the machine, a draper on said header unit movable transversely to said direction of movement of the machine for conveying material to the thresher, and a pick-up mechanism mounted in advance of the draper and attached to the header for gathering material from the ground as the thresher is moved over the ground and for conveying material to the draper; said pick-up mechanism comprising an endless series of tangs adapted to move adjacent the ground for collecting material from the ground, and means for moving said tangs in a closed path.

In testimony whereof, I have hereunto set my hand.

JACOB CLOVE.