Dec. 7, 1954 C. F. BALL 2,696,288

ROTARY GATHERING MECHANISM

Filed Aug. 28, 1952 4 Sheets-Sheet 1

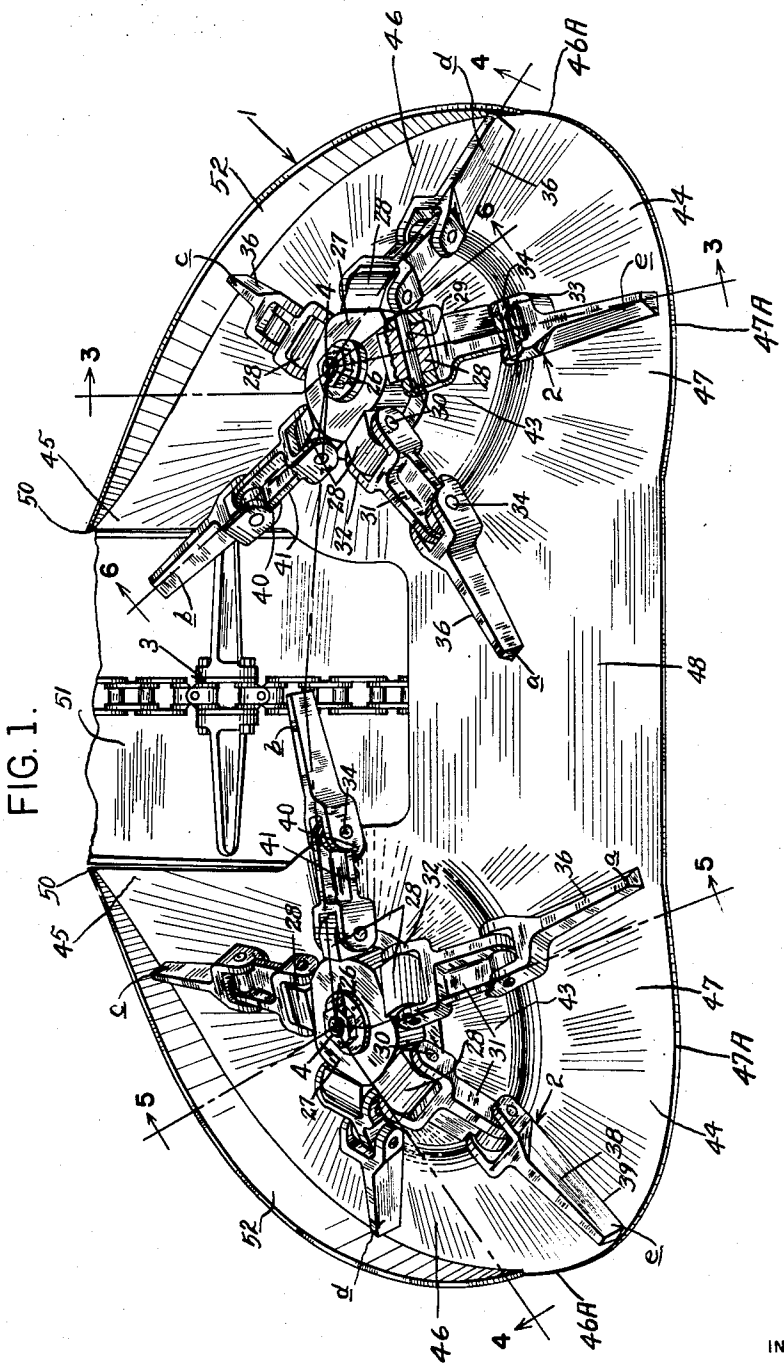

FIG. 1.

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FIG. 2

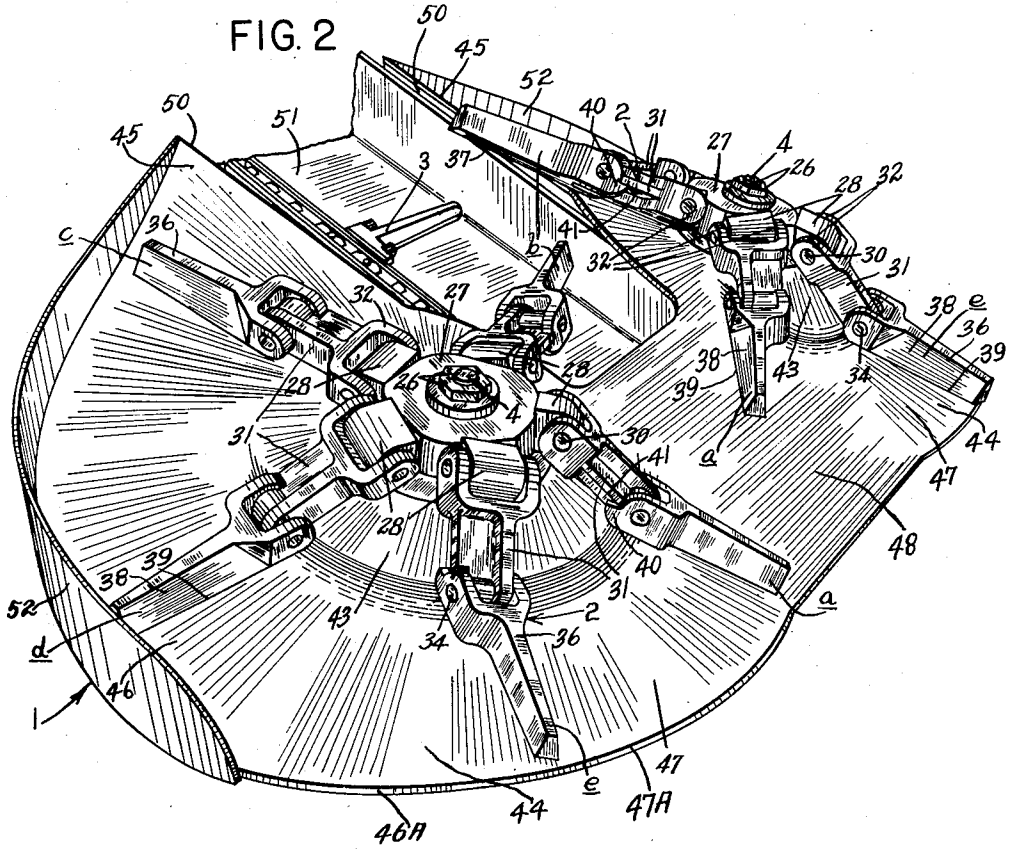
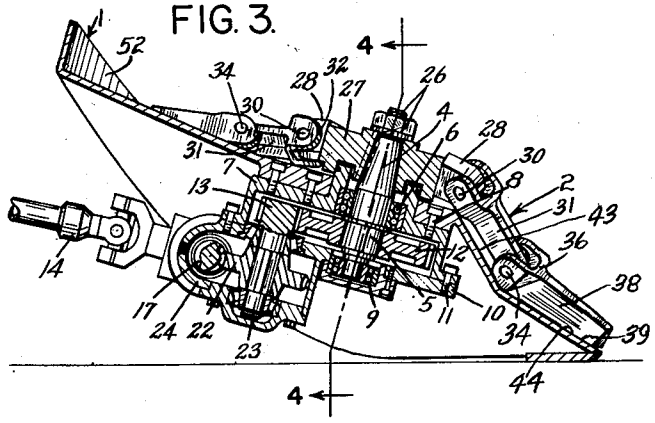


FIG. 3.



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ROTARY GATHERING MECHANISM

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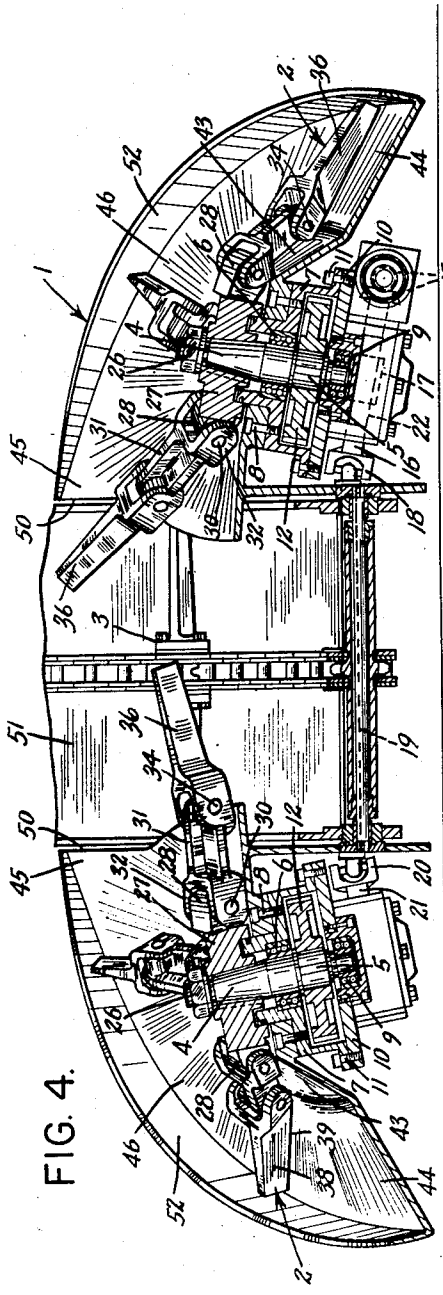

FIG. 4.

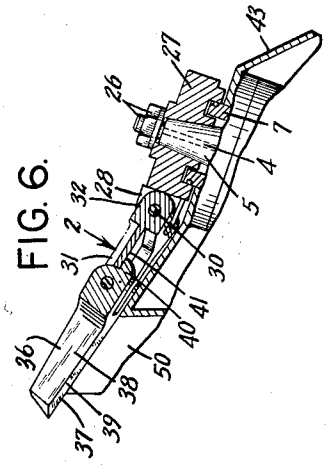

FIG. 6.

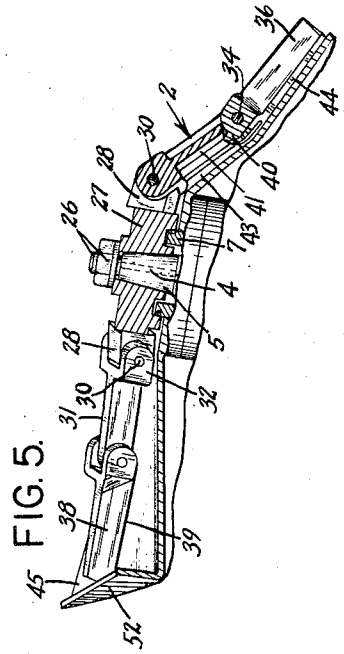

FIG. 5.

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ROTARY GATHERING MECHANISM

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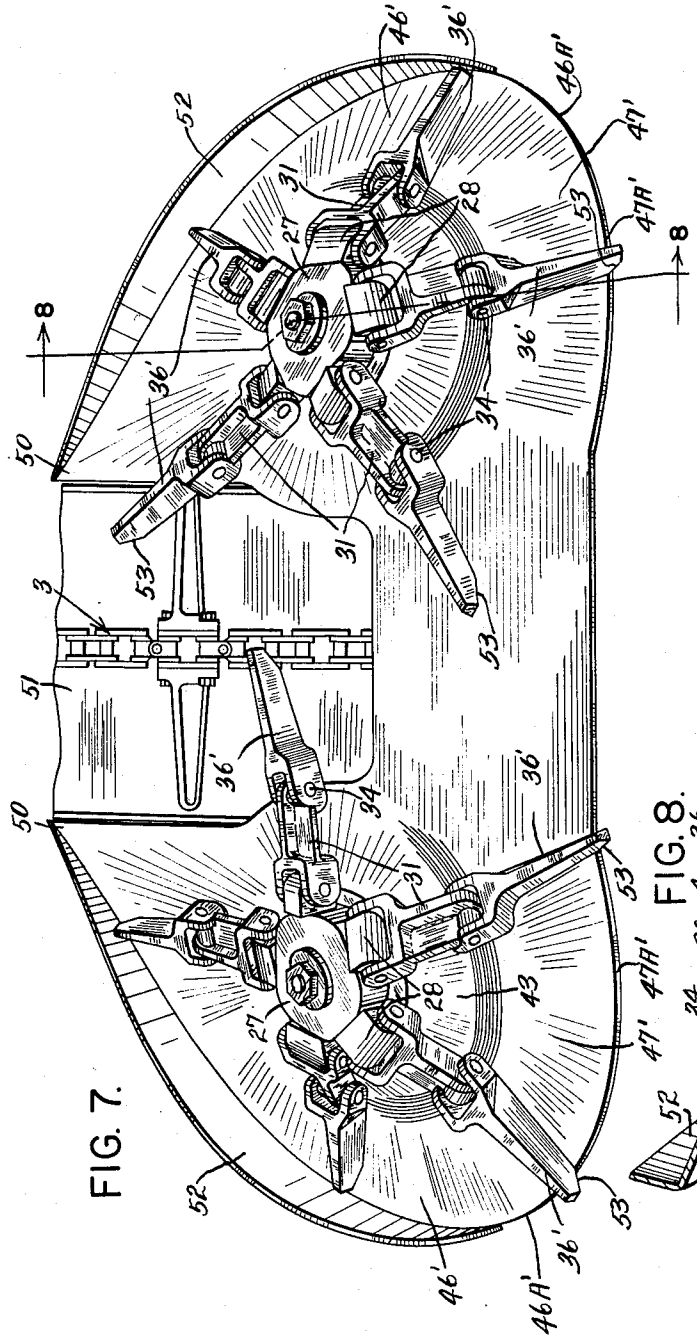

FIG. 7.

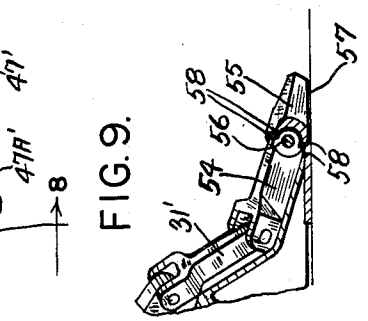

FIG. 9.

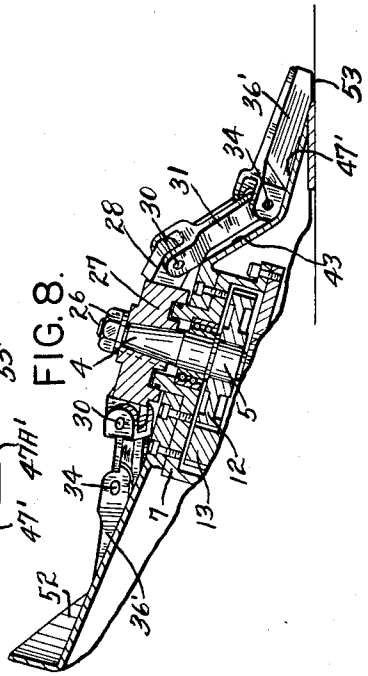

FIG. 8.

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United States Patent Office

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ROTARY GATHERING MECHANISM

Charles F. Ball, Franklin, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application August 28, 1952, Serial No. 306,878

7 Claims. (Cl. 198—9)

This invention relates to rotary gathering mechanism and more particularly to a rotary gathering mechanism especially designed for use with the loading head of a loading machine for gathering loose material on the floor or ground during either lateral or forward movement of the loading head.

In loading machines of certain types and particularly in the loading means of a continuous miner of a known type, it is desirable to load from the side as well as from the front, and the present invention contemplates improvements over known types of gathering mechanisms by effecting side loading as well as frontal loading in an improved and more efficient manner. The rotary gathering mechanism of the present invention is rotatable about an upstanding axis on a head frame and embodies articulated or jointed flights whereby the jointed flight members may readily follow the irregular or uneven surfaces of the frame for movement near the floor at the side as well as at the front of the loading head so that the loose material on the floor or ground may be effectively gathered and moved onto the conveying means of the machine. The articulated flights are mounted on and are driven by a revolving hub structure journaled on the frame of the loading head and the irregular surfaces of the head frame over which the flights move during hub rotation are so shaped that the flights may move laterally and downwardly along the side of the head, then laterally and inwardly at the front of the head and then move upwardly and rearwardly to discharge onto the conveying means. Each of the flights embodies an inner arm and an outer arm. By appropriately inclining slightly the pivotal axes at the inner ends of the inner arms with respect to a plane perpendicular to the hub axis the flights are tilted sidewise with their leading sides lower than the trailing sides so that, as the hub is rotated, the arms are maintained down against the irregular frame surfaces with the leading edges of the flights in scraping contact with the surfaces. The rotary flight structure is rugged and durable in design, and well adapted for its intended purpose.

An object of the present invention is to provide an improved gathering mechanism for a loading head for gathering the material on the floor or ground at the side as well as at the front of the head so that loading may be effected as the head is moved laterally as well as forwardly into the material to be loaded. Another object is to provide an improved rotary gathering mechanism having a novel articulated or jointed conveyor flight structure. Yet another object is to provide an improved rotary gathering mechanism embodying an improved articulated or jointed flight structure comprising an inner arm pivotally mounted on a rotary hub and an outer arm pivotally connected to the inner arm so that the jointed arms provide a conveyor flight which may move over uneven or irregular top surfaces on a head frame as the hub is rotated. Still another object is to provide an improved stop or abutment structure associated with the outer arm and cooperating with the inner arm to limit downward tilting of the outer arm with respect to a plane determined by its own pivot axis and a point in the pivot axis of the inner arm, as the mechanism is rotated. A still further object is to provide an improved arrangement of the flight arm pivots with respect to the axis of rotation of the gathering mechanism which, supplementing gravitational force, utilizes the resistance to loading movement of the flights to maintain the latter in scraping contact with the irregular

surfaces of the head frame during the gathering operation. These and other objects and advantages of the invention will, however, hereinafter more fully appear in the course of the ensuing description.

In the accompanying drawings there are shown for purposes of illustration one form and two modifications which the invention may assume in practice.

In these drawings:

Fig. 1 is a fragmentary front perspective view of a loading head with which a preferred form of the improved rotary gathering mechanism is associated.

Fig. 2 is a fragmentary side perspective view of the loading head and gathering mechanism shown in Fig. 1.

Fig. 3 is an axial section taken in the planes of line 3—3 of Fig. 1, showing the rotary hub structure and its drive.

Fig. 4 is a cross sectional view taken in the planes of line 4—4 of Figs. 1 and 3.

Fig. 5 is a detail section taken on line 5—5 of Fig. 1.

Fig. 6 is a detail section taken on line 6—6 of Fig. 1.

Fig. 7 is a view similar to Fig. 1 illustrating a modified construction.

Fig. 8 is an axial section taken in the planes of line 8—8 of Fig. 7.

Fig. 9 is a fragmentary axial section showing a further modification.

In this illustrative construction, as shown in the drawings, the gathering and loading head is generally designated 1 and may be used with a loading machine of any conventional type but is herein especially designed for use with a continuous miner of a type similar to that disclosed in the Russell and Sibley applications, Serial Nos. 102,995 and 102,996, both filed on July 5, 1949, and owned by the same assignee as the present invention.

In known types of loading machines and particularly in a continuous miner of the type referred to, it is desirable to effect gathering and loading of loose material on the floor or ground as the head is moved laterally as well as forwardly, and rotary gathering mechanism, generally designated 2, are arranged on upstanding axes at opposite sides of the loading head in position to gather the loose material and to move the same laterally and rearwardly onto a conveying means 3 which extends centrally between the gathering mechanisms, as shown in Figs. 1 and 2. The upstanding axes of the rotary gathering mechanisms are designated 4 and are inclined slightly both forwardly and outwardly at each side of the head in the manner shown. The driving means for the gathering mechanisms may assume various forms but herein for illustrative purposes comprises for each gathering mechanism an upstanding drive shaft 5 journaled at its upper portion in a bearing 6 supported within a casing 7 disposed beneath the head frame and detachably secured to the head frame as by screws 8. The lower end of each shaft is journaled in a bearing 9 carried by a detachable bottom cap or plate 10 held in position on the head frame as by screws 11. The casing 7 has arranged therein a spur gear 12 keyed to the shaft 5 and having a spur pinion 13 meshing therewith (Fig. 3). A flexible shafting 14 drives through bevel gearing 15, indicated in dotted lines in Fig. 4, a transverse shaft 16 to which a worm 17 (Fig. 3) is secured. The shaft 16 is connected by a universal coupling 18 to a cross shaft 19 which is in turn connected by a universal coupling 20 to a transverse shaft 21 which likewise has a worm secured thereto. These worms have teeth of opposite hand and mesh with worm wheels 22 keyed to upstanding shafts 23 journaled in bearings supported within housings 24 integral with the bottom caps 10. The pinions 13 are formed on the upper portions of the upstanding shafts 23. Thus, when the flexible shafting 14 is suitably driven the rotary gathering mechanisms may revolve simultaneously in relatively opposite directions so that the loose material on the floor or ground may be gathered at the sides and front of the head and may be swept inwardly and rearwardly onto the conveying means 3.

Now referring to the detail structure of each rotary gathering mechanism as shown in Figs. 1 to 6 inclusive it will be noted that keyed to the tapered upper end of each shaft 5 and held tightly in position thereon as by

a screw and nut connection **26** is a rotary hub **27** having a series of equally spaced lateral lugs **28** traversed by bores **29** arranged with the bore-axes inclined slightly with respect to a plane in which the upper hub surface lies. These lug bores receive pivot pins **30** on which the inner ends of inner arms **31** are pivotally mounted to tilt in upstanding planes perpendicular to the axes of the pivot pins. The arms **31** have spaced inner lugs **32** which are perforated to receive the projecting ends of the pivot pins and the outer ends of the arms have transverse bores **33** which are preferably—and that is the arrangement illustrated—parallel with the lug-bores **29** and receiving pivot pins **34**. Pivotally mounted on the pivot pins **34** are outer arms **36** having spaced perforated lugs at their inner ends for receiving the projecting ends of the pivot pins **34**. The outer arms each have a bottom surface **37** and an upwardly and rearwardly inclined forward surface **38** and the surfaces **37** and **38** merge at the forward side of the arm to provide a leading edge **39** which moves in linear contact with and scrapes over the irregular or uneven surface of the head frame as the hub is rotated. By inclining the axes of the pivot pins **30** of the inner arms with respect to a plane perpendicular to the axes of the revolving hub, in the manner described, the outer arms will, when the inner arms which support them slope downwardly outwardly and they themselves are moving in contact with the frame surface which they traverse (as in the positions of *a*, *e* and *d* shown in Figure 2), be tilted sidewise in such a manner that their forward edges make scraping contact with such surface, and the bodily position of each of the outer flight arms is rearwardly disposed, in terms of direction of orbital travel, as compared with that which would have existed had the pivot axes of the inner arms not been tilted with respect to a plane perpendicular to the hub axis. Thus, the pivotally connected inner and outer arms cooperate to provide articulated or jointed conveyor flights which may readily travel over the uneven or irregular surfaces of the head frame to gather and convey the loose material to be loaded.

The outer flight arms **36** have lugs or abutments **40** at their inner ends which underlie bottom surfaces **41** of the inner arms, and these lugs prevent tilting of the outer flight arms downwardly about their pivots below a position substantially in alinement with the inner arms. The arms are free to swing upwardly about their pivots so that they may readily follow the irregular frame surfaces and may pass over any obstruction which might get beneath the arms, and the inner arms are free to swing downwardly about their pivots to enable the arms normally to remain in contact with the uneven head frame surfaces. The particular arrangement and shape of the arms tends, however, to maintain the outer arms in contact with the frame surfaces.

The head frame at each side of the head has inclined, tapering or generally frusto-conical surfaces **43** which diverge downwardly, and a flared bottom surface **44** extends generally radially outwardly with respect to the axes of each gathering mechanism, and slopes from its uppermost surface **45** forwardly and downwardly at **46** to its lower inclined surface **47**. The sloping surfaces **46** and **47** terminate along curved outer generally arcuate edges **46A** and **47A**. A forwardly and downwardly inclined plane intermediate surface **48** extends between and joins with the inclined surfaces **47**, as shown in Fig. 2. The head frame has parallel vertical side surfaces **50** at the sides of a passageway **51** extending between the gathering mechanisms and in which the conveying means **3** is arranged, and the upper sloping surfaces **45** extend inwardly and join with the tops of these vertical surfaces.

As the gathering mechanisms are rotated, the arms indicated at *a* move upwardly and rearwardly over the inclined intermediate surface **48** to elevate the loose material and to discharge it onto the conveying means **3** and as these arms move rearwardly from the intermediate surface, as indicated at *b*, the lugs **40** on the outer arms engage the bottom surfaces of the inner arms so that the outer arms cannot tilt downwardly about their pivots into the passageway, and the arms indicated at *c* pass over the uppermost surfaces **45** and then move laterally and downwardly along the lateral sloping surfaces **46** as indicated at *d* and then move inwardly over the forward bottom surfaces **44** as indicated at *e* to sweep the material laterally and inwardly toward the intermediate surface **48**. As the arms travel along the sloping side surfaces downwardly from the uppermost surfaces the outer arms may tilt upwardly about their pivotal connections with the inner arms and the inner arms may freely tilt downwardly, so that the inner arms may ride over the tapering or generally frusto-conical surfaces **43** and the outer arms may closely follow the downwardly sloping and inwardly curving surfaces of the head frame over which they ride. Thus, the flight arms travel along the sides of the head frame and laterally along the front of the head frame so that the loose material on the floor or ground may be effectively gathered and loaded as the head is moved either forwardly or laterally into the material. The sides of the head frame have upstanding retaining flanges **52** which curve upwardly and inwardly to the sides of the passageway **51** which receives the centrally located conveying means **3**.

To repeat somewhat, the structures with which the systems of rotating arms and their supports cooperate provide generally circular upper surfaces surrounding the axes of rotation of the hubs. From the edges of these generally circular surfaces there extend the surfaces **43**, which may be described as frusto-conical, but of varying cone angle, the slope length of these surfaces being determined, where they are to be contacted by the inner arms, by the length of the inner arms. It will be noted that these surfaces do not extend completely around the circumference of the circles first mentioned. Outwardly of the base of the so-called frusto-conical surfaces **43** there are the surfaces **46**, **47** whose characteristics are determined by the necessity for bringing the arms down from the positions they occupy after passing above the edges of the trough through which material is moved, down to the floor surface from which material is to be loaded. The upper portions **45** of these last surfaces slope obliquely outwardly and downwardly from the edges of the conveyor trough. The forward portions **46**, **47** of these outer surfaces may again be perhaps best described as resembling frusto-conical surfaces of varying cone angle, extending between the floor and the lower edges of the second surfaces, and they are determined as to their slope lengths in large measure by the lengths of the outer arms. It will be understood that the particular conformation of the several surfaces will vary, depending upon trough inclination and other dimensions varying with design, but in general the lengths of the inner and outer arms will be determining factors in the design of these surfaces.

In the gathering mechanism so far described, the proportions of the arm structures are made such that their outermost ends do not project beyond the forward generally arcuate edges **46A** and **47A**. Such arrangements are well adapted to the handling of material such as is produced by the vein-attacking and disintegrating mechanism of a known type of continuous miner. If shot coal, however, or other material in which the material to be handled is, though fragmented, still in relatively solid condition, it is desirable that the arm structures attack the material to be loaded in advance and laterally of the forward edges of the inclined head frame structure over which the material is to be loaded, thus avoiding the necessity for forcing the forward and lateral edges of the loading head into a relatively solid mass of material. An appropriate arrangement for the latter type of use is disclosed in Fig. 7 wherein the head frame has its sloping surfaces **46′** and **47′** terminating along curved outer generally arcuate edges **46A′** and **47A′** which are set back from the outer extremities of the outer arms **36′** of the rotary gathering mechanisms so that the outer arms may sweep over the floor in advance and laterally of the head frame to gather material on the floor and to sweep it inwardly and rearwardly onto the conveying means **3**. The outward lower portions of the outer arms are desirably flattened at **53** in advance of the arcuate edges, as shown in Fig. 8, so that the outer portions of the arms may travel close to the floor outwardly beyond the sides and front portions of the head frame.

In the modified construction shown in Fig. 9, the arms of the rotary gathering mechanisms each comprises three pivoted arm elements **31′**, **54** and **55** and the inner arm **31′** is identical to those shown in Figs. 1 to 6 inclusive while the intermediate arm **43** is desirably somewhat shorter than the arm **38** of the other embodiment. The arm **55** is desirably relatively short and is pivotally con-

nected at **56** to the outer portion of the intermediate arm to swing in upright planes in axes parallel to the pivotal axis of the inner and intermediate arms, and the forward lower surface **57** of the outer arm is adapted to travel close to the floor beyond the sides and in advance of the head frame generally in the manner of the modification shown in Fig. 8. The outer arm has suitable stop lugs **58** engageable with surfaces on the outer portion of the intermediate arm for limiting the swinging movement of the outer arm either upwardly or downwardly relative to the intermediate arm. Thus, by plurally articulating the arm structures the gathering mechanisms, when rotated, may closely sweep over the irregular surfaces of the head frame and outwardly beyond the frame to gather the material on the floor and to move the same inwardly and rearwardly onto the conveying means **3**. Otherwise this embodiment is similar to the embodiment first above described.

As a result of this invention an improved rotary gathering mechanism is provided having an improved articulated or jointed flight structure which may readily ride over the irregular surfaces along which the flights travel as the mechanism is rotated. By the provision of the articulated rotary flight structure and the associated irregular surfaces on the head frame, the jointed flight arms may freely traverse the irregular surfaces to gather the material either at the side or at the front of the head as the latter is moved into the material to be loaded and may move effectively the material upwardly and rearwardly over the frame surfaces to discharge onto the conveying means. By inclining the flight pivots and tilting the flights sidewise relative to the hubs, the flights will, as they encounter resistance to movement set up by the material resting on the sides and forward surfaces of the head frame, be urged downwardly toward the irregular surfaces on the head frame so that a more positive scraping action of the leading edge on the outer arms is provided as they ride or slide over the irregular surfaces on the head frame. The so-called irregular surfaces, so far as they are made up of the portions **45**, **46**, and **47**, are so arranged that the edges **39** of the outer flight arms **36** may ride smoothly over them, while the inner flight arms **31**, at least during the period during which they move over the arc which bounds its forward surface portions **46** and **47**, follow closely along the surface **43**. The improved rotary gathering mechanism and its novel articulated flight structure are relatively compact and simple and rugged in design. These and other advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described one form and two modifications which the invention may assume in practice, it will be understood that this form and these modifications of the same are shown for purposes of illustration and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim is new and desire to secure by Letters Patent is:

1. A gathering mechanism comprising a conveyor flight pivoted to tilt in upright planes and movable in an orbital path along a surface over which the material to be gathered is conveyed, means for mounting said flight for orbital movement, and means for pivotally

connecting said flight to said mounting means with the pivotal axis of said flight inclined slightly to its instantaneous path of travel along said surface to cause said flight to assume a tilted position with respect to said surface so that the forces due to engagement of the flight with the material being moved tend to hold the flight down toward said surface.

2. A gathering mechanism as set forth in claim 1 wherein said mounting means for said flight is in the form of a rotatable hub to which the flight is pivotally connected and wherein the hub axis is inclined laterally and forwardly with respect to the vertical to cause the outer portion of said flight as said hub revolves to move through a substantially circular path near the floor level both at the side and the front of the mechanism.

3. A gathering mechanism comprising an upstanding revoluble structure, a frame on which said structure is journaled for rotation about an upstanding axis, said frame having an irregular upper surface radiating from said axis and having its outer edge disposed near the floor level both at the side and the front of the mechanism, and a series of articulated conveyor flights radiating from said revoluble structure and each having an inner arm pivotally connected to said revoluble structure to tilt in upright planes about a pivotal axis and an outer arm pivotally connected to said inner arm to tilt in similar planes about a parallel axis, with the pivots of said arms so arranged that upon rotation of said structure said outer arms may traverse said irregular upper surface of said frame.

4. A gathering mechanism as set forth in claim 3 wherein said pivotally connected inner and outer arms of each flight have coacting abutment means for limiting tilting movement of the outer arm in upright planes in one direction with respect to the inner arm.

5. A gathering mechanism as set forth in claim 3 wherein the pivotal axes of said inner and outer arms of said flights are tilted slightly with respect to a plane perpendicular to the axis of rotation of said structure so that the forces due to engagement of the flights with the material being moved along said irregular upper surface tend to hold said arms down toward said upper surface.

6. A gathering mechanism as set forth in claim 3 wherein each conveyor flight has a third arm pivotally connected to said second mentioned arm to tilt in upright planes about an axis parallel to the pivotal axes of said first and second mentioned arms.

7. A gathering mechanism as set forth in claim 3 wherein each flight extends outwardly at the floor level beyond the outer edge of said irregular upper surface.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
765,832	Hamilton	July 26, 1904
1,796,943	Pratt	Mar. 17, 1931
1,821,440	Levin	Sept. 1, 1931
2,183,383	Sloane	Dec. 12, 1939
2,575,287	Myers	Nov. 13, 1951

FOREIGN PATENTS

Number	Country	Date
683,183	Germany	Nov. 1, 1939