Aug. 15, 1950 N. CORDIS 2,518,601

SILO APPARATUS

Filed July 1, 1947 3 Sheets-Sheet 1

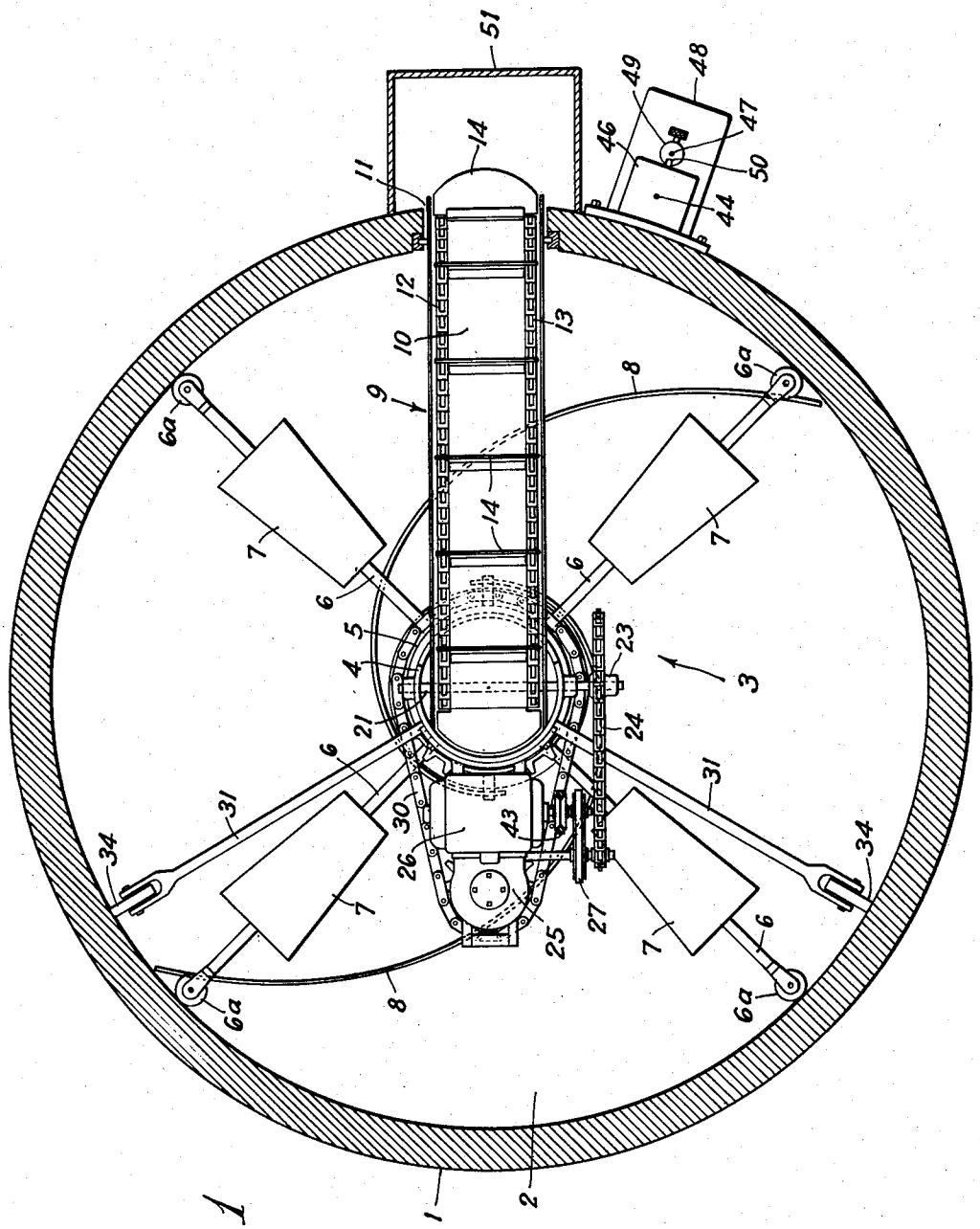


Fig. 1

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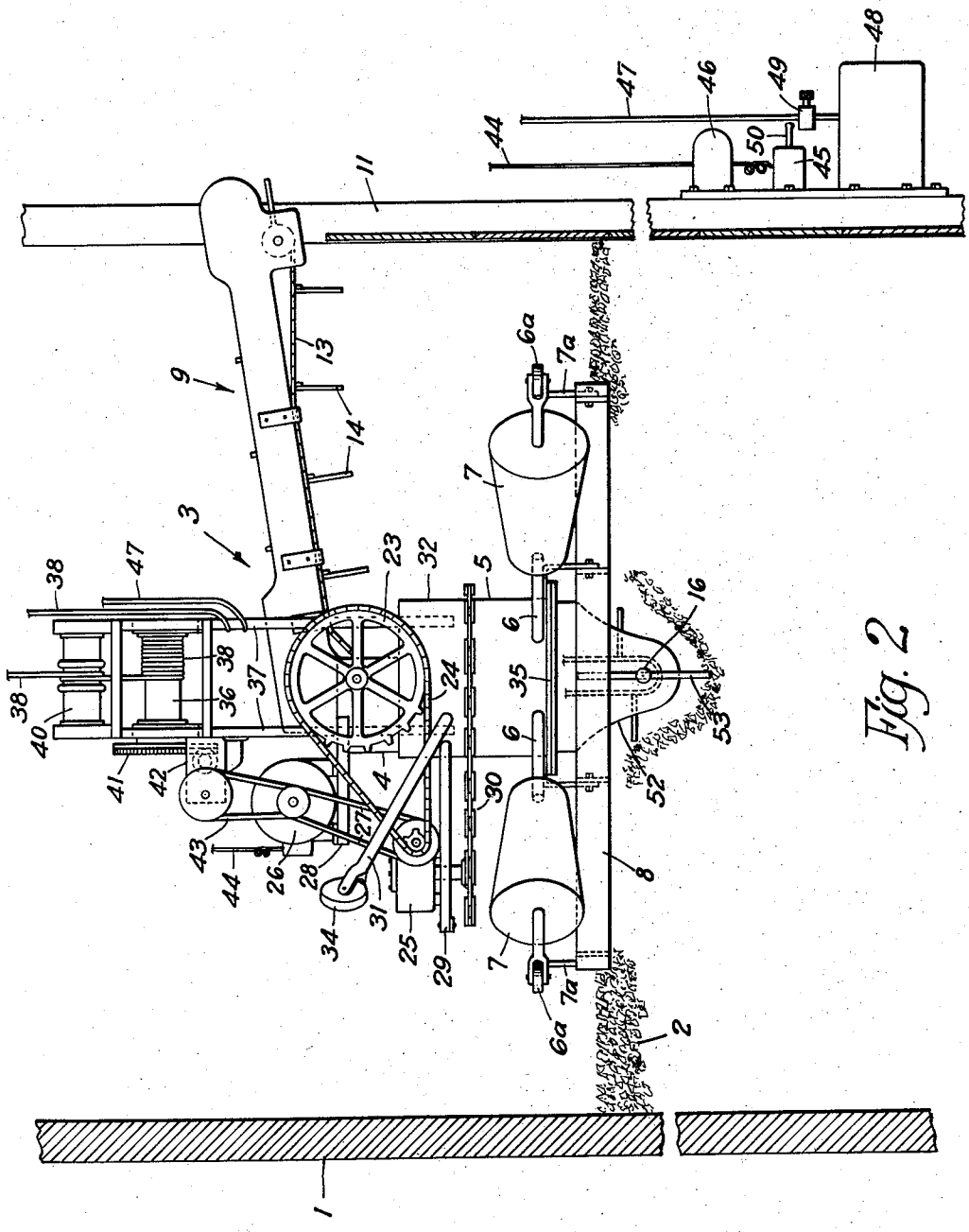


Fig. 2

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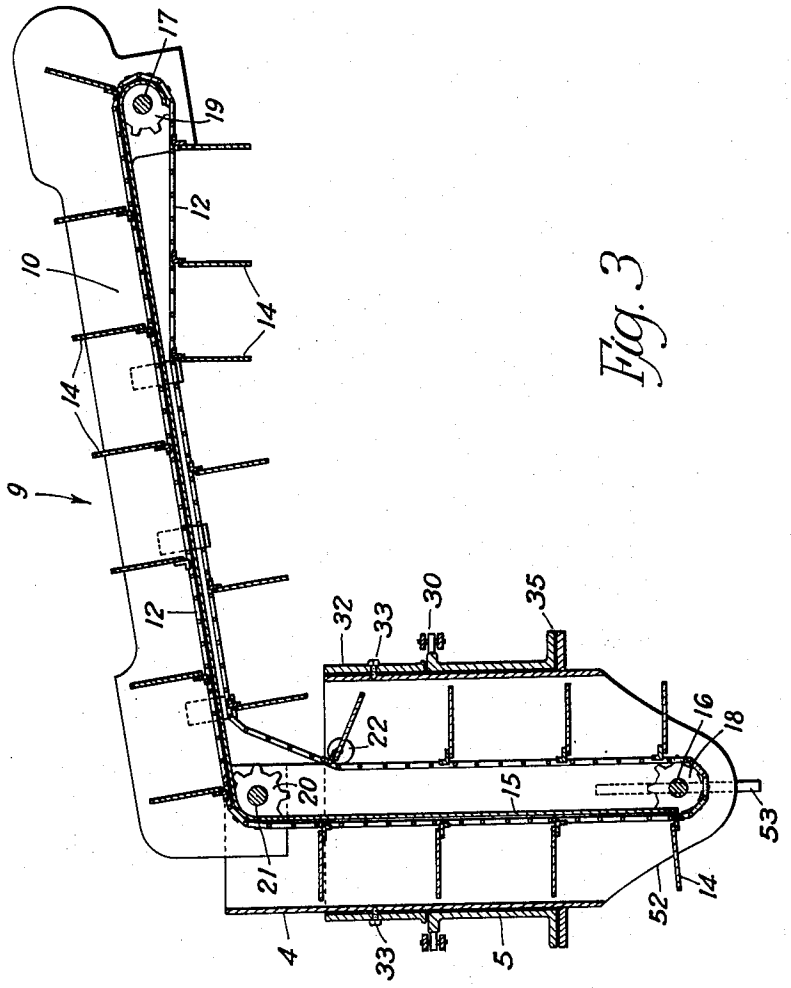


Fig. 3

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SILO APPARATUS

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6 Claims. (Cl. 214—17)

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This invention relates generally to silo apparatus, and more particularly to a silage dispenser which is also suitable for use in my novel method of filling a silo. Apparatus of the general type to which this invention relates generally comprises a frame member having mounted thereon gathering means, such as rotating scrapers, which are suitably curved and arranged to engage the topmost layer of the silage or other livestock feed that is stored in a silo and gather it together, and a suitable conveying means, such as a bucket conveyor or a screw conveyor, whereby the gathered feed is picked up and discharged outside of the silo. It has been customary in dispensers of this general type that the frame member be suspended within the silo by cables. In some, provision is made for automatically lowering the frame member within the silo as the silage is removed thus providing an automatic feed for the scrapers. In the devices that are now known, the silage to be removed by the conveyor is accumulated in a pile by the scrapers, which usually results in an inefficient loading of the conveyor means. Furthermore, in these prior devices, there is a tendency on the part of the whole frame member and its rotating scrapers to cant within the silo in spite of provision of guide arms which usually serve only to keep the dispenser centered. This canting in turn causes the scrapers to dig deeper on one side than the other, thus accentuating the difficulty.

It is, therefore, an object of this invention to provide an improved silo apparatus wherein a more efficient loading of the conveyor means, which cooperates with the scrapers, is obtained. It is a further object of this invention to provide an improved apparatus which is not necessarily supported by cables and in which an improved control of the feeding of the scrapers to the packed silage is obtained.

In addition to the aforesaid objects, it is a further object of this invention to provide a novel method of loading a silo and particularly to provide a dispenser which can be operated to facilitate loading according to my improved method. It is essential in loading a silo, particularly with silage, that the material be evenly distributed and well packed to prevent the formation of air pockets which in turn may cause spoilage. It is present practice to blow the silage to the top of a silo and have workers inside to distribute and pack the material. This, of course, is a very undesirable task which is injurious to the health of the workers.

Further objects and advantages of my invention will be apparent from the following description of my invention.

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In general, my improved apparatus is provided with a plurality of rotating support members, or rollers, which are attached to a frame member and ride upon the bed of silage in the silo. Scrapers are adjustably associated with the rollers so as to dig into the bed a predetermined depth with respect to the rollers upon rotation about the frame member. Though I prefer to also partially support my dispenser with the customary cables, I may in some cases dispense with the same.

Where, however, my novel combination of cables and rollers is particularly important is in practicing my improved loading method. Here, by reversing the rotation of my improved dispenser, I obtain the benefit of the scrapers as distributing means and of the rollers as packing means. Though I have found that as the silo fills up, the apparatus without the cables will ride on top of the silage, I prefer to raise the entire apparatus by means of the cables at a rate controlled by the number of revolutions of the scrapers.

To obtain more efficient loading of the conveyor which removes the material gathered by the scrapers, I dispose the loading end of the conveyor at a point below the horizontal plane of the scrapers. In this way, the feed or silage is dumped down into the conveyor insuring that it is filled to capacity. In this connection, since a portion of my apparatus is below the scraper, I provide means adjacent the bottom end of the conveyor which breaks up and agitates the feed, thus permit the conveyor, in effect, to dig a cavity for itself.

The above features of my improved apparatus and others will be best understood by reference to the following detailed description of a preferred embodiment and to the attached drawings forming a part thereof, wherein like numerals indicate like parts in the various figures and wherein:

Figure 1 is a horizontal section of a silo having mounted therein my improved silo apparatus shown in plane view with parts broken away.

Figure 2 is a vertical section of the silo, showing a side elevation of my improved apparatus.

Figure 3 is a vertical section through the conveyor of the silo apparatus.

Referring now to the figures, silo 1, in which is stored silage 2, is equipped with my silo apparatus 3. It comprises a tubular frame member 4 on which is rotatably mounted a collar 5 extending

from which are radial arms 6 upon which are rotatably mounted drums 7. The drums are generally frustro-conically shaped so that they will track in a circle on the bed of silage. Carried by adjacent pairs of radial arms 6 by hangers 7a are scrapers 8. The scrapers 8 are suitably curved and may be tapered in width in a well-known manner so that upon rotation of the collar 5 material scraped up will move toward the center of the silo. The relative vertical position of the scrapers with respect to the arms 6 can be adjusted by securing the hangers 7a in one of various vertical positions. At each end of arms 6 is a roller 6a for engaging the walls of the silo.

Also secured to the tubular frame member 4, is a conveyor 9 which preferably is of a conventional chain and paddle type comprising a trough 10 supported on the frame member and extending outwardly through the silo door 11 to a point outside the silo, and a pair of endless chains 12 and 13 having secured therebetween paddles 14. The conveyor not only extends the length of the trough but also turns and passes vertically down through the inside of the tubular frame member 4. An extension at the bottom of the trough 15 is provided within the tubular frame member to cooperate with the paddles to permit material to be raised vertically from the base of the frame member to the bottom of the trough, and thus along the trough to the outside of the silo. Suitable journaled axles 16 and 17 and pairs of sprockets 18 and 19 are provided at the bottom end of the frame member and at the far end of the trough for supporting the chains 12 and 13 which are driven by a pair of driving sprockets 20 mounted on axle 21 journaled in the frame member. An idler 22 is provided to support the underside of the chains.

To one end of the axle 21 is secured a sprocket 23 suitably connected by a chain 24 to a conventional transmission 25 which is in turn connected to a power source such as motor 26 by belt drive 27. The motor is mounted on the frame member 4 by a suitable bracket 28 and the transmission by bracket 29.

The motor and transmission provide the power for operating the conveyor and also for rotating the collar 5 and hence the drums 7 and scrapers 8 through a suitable chain and gear drive 30 as shown coupling the collar 5 and the transmission 25.

To assist in stabilizing the entire apparatus, guide arms 31, which are secured to a collar 32 (Fig. 1) fixed on a frame member 4 by screws 33, are provided which extend outwardly and engage the walls of the silo at equally spaced points. At the ends of the guide arms may be provided wheels 34 or other shoe members which are preferably resiliently urged to contact with the walls of the silo. The collar 32 has the additional function of cooperating with a peripheral flange 35 welded or otherwise fastened to the frame member 4 to secure the collar 5 from vertical movement on the frame member.

For purposes hereinafter more fully set forth, there is further mounted to the frame member 4 a winch 36 (Fig. 2) by means of suitable bracket 37 upon which is wound a cable 38 which is rigidly secured to the bracket at 37 and passes over a pulley at the top of the silo (not shown). I prefer to provide for cooperation with the winch, an idler 40 around which the cable passes once, which idler is also rotatably mounted on the bracket 37. The idler serves the purpose of maintaining uniform vertical spacing between the points at which the cable supports the dispensing apparatus, whereas I have found by operating without the idler there is a tendency for the shifting of the cable along the winch to cause a rocking action in the dispensing apparatus.

The winch is driven by motor 25 through a gear 41 and suitable transmission 42 connected to the motor by a belt drive 43. The power for the motor is provided by a power line 44 which passes up over a suitable pulley at the top of the silo (not shown) and is connected on the outside of the silo at the base thereof to a suitable power outlet and switch arrangement 45. The switch is preferably of a conventional three way type, that is, providing for the reversible operation of the motor as well as stopping and starting of the motor. To take up the slack of the power line between the switch and the moving apparatus, I provide means such as a drop box 46 in which the cable coils itself. A conventional spring loaded reel may also be used. To obtain automatic stopping of the apparatus after a predetermined amount of silage has been unloaded, I provide a suitable mechanism comprising a cord 47 which is fastened at one end of the apparatus and passes over a suitable pulley at the top of the silo (not shown) and down along the outside of the silo to a position cooperating with the switch box 45. A suitable drop box 48 is provided for the cord 45. At the switch box, I provide on the cord an adjustable ring 49 which is adapted to engage a trigger 50 of the switch mechanism for the purpose of shutting off the motor.

Referring now to the operation of my apparatus, an operator outside the silo sets the adjustable ring 49 on the rope 45 the distance from the trigger 50 equal to the number of inches of silage he wishes to remove. He then manually operates the switch to start the motor in a direction which causes the scrapers 8 to rotate and gather silage towards the center of the silo. Simultaneously with the operation of the scrapers, the paddles 14 of the conveyor 9 pass downwardly through the tubular frame member to a point below the scrapers and upon their upward travel the silage accumulated by the scrapers is dumped down upon them insuring their maximum loading and is carried upwardly and outwardly through the trough 10 and is discharged outside of the silo in a downspout 51. The base of the frame member is suitably cut away at 52 to permit access of the paddles to the accumulated silage. To insure the breaking up of the silage in the vicinity of the paddles, which is an area where the scrapers cannot function, I provide a pair of spike wheels 53 which are mounted on the axle 16 of the conveyor. By breaking-up the silage at this point, I prevent overloading of the conveyor, and I also prevent the frame member from bottoming on the silage bed in a manner to prevent the necessary downward vertical movement required for the continual engagement of the scrapers with the bed.

As silage is removed, the rollers 7 which ride on the bed will continually permit the apparatus to move downwardly. The maximum rate of downward movement, however, is limited by the speed at which the cable 38 is fed out by the winch 36. Since the winch 36 and the rollers 7 are driven by the motor there is necessarily a fixed ratio between the rate at which the apparatus is permitted to move downwardly by the cable and the number of revolutions of the rollers and scrapers. This ratio may be adjusted within

limits by providing a conventional adjustable gear reduction mechanism with the transmission 42.

When the apparatus has delivered the desired number of inches of feed or silage as determined by the setting of the adjustable ring 49, the motor will be automatically shut-off by the engagement of the ring with the trigger.

In order to effect an efficient loading of the silo, I may reverse the direction of my motor 25 and thus the direction of rotation of the rollers and scrapers as well as that of the winch. As silage is blown in the top of the silo in the conventional manner, the scrapers will serve to distribute the silage, tending to move it towards the outside of the silo, and the rollers will serve to pack down the silage, thus avoiding any air holes which may result in spoilage. Because the distribution effected by the scrapers in reverse direction is not always uniform, since their prime function is to serve as gathering means, I have found that reliance upon the rollers alone to raise the dispensing apparatus within the silo as it fills up sometimes results in canting of the apparatus. This canting is overcome in the preferred form as shown by the fact that the dispensing apparatus is raised through the operation of the winch and the cable at a predetermined rate independently of the rate at which the silo fills up, and hence any tendency to cant can be immediately corrected by cutting off the blower for a period sufficient to permit the cable to suspend the apparatus within the silo in its customary vertical plane to which it is biased by the guide arms 31. This reverse operation of my apparatus effects a novel method of loading a silo since the distributing and packing are automatically handled without the necessity of having any workers within the silo.

I have described a preferred embodiment of my apparatus, and I appreciate that various other embodiments and modifications will occur to those skilled in the art; consequently no limitations are intended hereby, except as are contained in the following claims.

I claim:

1. A silo apparatus for loading and unloading a silo comprising a central tubular frame member, a collar rotatably mounted on said frame member, means for restricting axial movement of said collar, radial arms mounted on said collar extending to the walls of the silo, frustro-conical drums rotatably carried on said arms and adapted to roll on the bed of material in said silo, a plurality of curved scraper elements carried on said arms, said scrapers and rollers adapted to move in horizontal planes above the bottom end of said tubular frame member, a trough carried by said frame member and extending therefrom to a point outside the silo through an opening therein, an endless chain and paddle conveyor, one end of which is located at the base of said frame member and the other end of which is located at the end of the trough outside of the silo, said chain and paddles being adapted to move through the tubular frame member and over and under the trough in cooperative relation therewith, agitating means mounted on the bottom of said frame member adapted to be driven by said conveyor for agitating and breaking up silage, a winch carried by said frame member, a cable secured at one end of said frame member and at the other end of said winch, an idler carried in cooperative relationship to said winch for maintaining the cable against horizontal movement with respect to said frame member, a reversible motor carried by said frame member, means coupling said motor with said collar for rotating the same, means coupling said motor with said chain conveyor for driving the same at a rate proportional to the rate of rotation of said collar and means coupling said motor to said winch for operating the same at a rate proportional to the rate of rotation of said collar, switching means outside the silo operably connected to said motor for effecting stopping, starting and reversing of said motor, and automatic stopping means associated with said switching means, said automatic stopping means comprising a cord connected to said frame member and passing outside said silo adjacent said switching means and a ring secured to said cord, said ring being adjustable thereon, said ring being adapted to engage said switching means upon a predetermined vertical downward movement of said frame member.

2. A silo apparatus for loading and unloading a silo comprising a central tubular frame member, a collar rotatably mounted on said frame member, means for restricting axial movement of said collar, radial arms mounted on said collar extending to the walls of the silo, frustro-conical drums rotatably carried on said arms and adapted to roll on the bed of material in said silo, a plurality of curved scraper elements carried on said arms and vertically adjustable relative thereto, said scrapers and roller adapted to move in horizontal planes above the bottom end of said tubular frame member, a trough carried by said frame member and extending therefrom to a point outside the silo through an opening therein, an endless chain and paddle conveyor, one end of which is located at the base of said frame member and the other end of which is located at the end of the trough outside of the silo, said chain and paddles being adapted to move through the tubular frame member and over and under the trough member in cooperative relation therewith, agitating means mounted on the bottom of said frame member adapted to be driven by said conveyor for agitating and breaking up silage, a winch carried by said frame member, a cable secured at one end of said frame member and at the other end of said winch, an idler carried in cooperative relationship to said winch for maintaining the cable against horizontal movement with respect to said frame member, a reversible motor carried by said frame member, means coupling said motor with said collar for rotating the same, means coupling said motor with said chain conveyor for driving the same at a rate proportional to the rate of rotation of said collar and means coupling said motor to said winch for operating the same at a rate proportional to the rate of rotation of said collar, and switching means outside the silo operably connected to said motor for effecting stopping, starting and reversing of said motor.

3. A silo apparatus for loading and unloading a silo comprising a central tubular frame member, a collar rotatably mounted on said frame member, means for restricting axial movement of said collar, radial arms mounted on said collar extending to the walls of the silo, frustro-conical drums rotatably carried on said arms and adapted to roll on the bed of material in said silo, a plurality of curved scraper elements carried on said arms and vertically adjustable relative thereto, said scrapers and rollers adapted to move in horizontal planes above the bottom end of said tubular frame member, a trough carried by said

frame member and extending therefrom to a point outside the silo through an opening therein, an endless chain and paddle conveyor, one end of which is located at the base of said frame member and the other end of which is located at the end of the trough outside of the silo, said chain and paddles being adapted to move through the tubular frame member and over and under the trough member in cooperative relation therewith, a winch carried by said frame member, a cable secured at one end of said frame member and at the other end of said winch, an idler carried in cooperative relationship to said winch for maintaining the cable against horizontal movement with respect to said frame member, a reversible motor carried by said frame member, means coupling said motor with said collar for rotating the same, means coupling said motor with said chain conveyor for driving the same at a rate proportional to the rate of rotation of said collar and means coupling said motor to said winch for operating the same at a rate proportional to the rate of rotation of said collar, and switching means outside the silo operably connected to said motor for effecting stopping, starting and reversing of said motor.

4. A silo apparatus for loading and unloading a silo comprising a central tubular frame member, a collar rotatably mounted on said frame member, means for restricting axial movement of said collar, radial arms mounted on said collar extending to the walls of the silo, frustro-conical drums rotatably carried on said arms and adapted to roll on the bed of material in said silo, a plurality of curved scraper elements carried on said arms, said scrapers and rollers adapted to move in horizontal planes above the bottom end of said tubular frame member, a trough carried by said frame member and extending therefrom to a point outside the silo through an opening therein, an endless chain and paddle conveyor, one end of which is located at the base of said frame member and the other end of which is located at the end of the trough outside of the silo, said chain and paddles being adapted to move through the tubular frame member and over and under the trough in cooperative relation therewith, a winch carried by said frame member, a cable secured at one end of said frame member and at the other end of said winch, an idler carried in cooperative relationship to said winch for maintaining the cable against horizontal movement with respect to said frame member, a reversible motor carried by said frame member, means coupling said motor with said collar for rotating the same, means coupling said motor with said chain conveyor for driving the same at a rate proportional to the rate of rotation of said collar and means coupling said motor to said winch for operating the same at a rate proportional to the rate of rotation of said collar, switching means outside the silo operably connected to said motor for effecting stopping, starting and reversing of said motor, and automatic stopping means associated with said switching means, said automatic stopping means comprising a cord connected to said frame member and passing outside said silo adjacent said switching means and a ring secured to said cord, said ring being adjustable thereon, said ring being adapted to engage said switching means upon a predetermined vertical downward movement of said frame member.

5. A silo apparatus for loading and unloading a silo comprising a central tubular frame member of substantial diameter, radial arms rotatably carried by said tubular frame member and extending to the walls of the silo, a frustro-conical drum rotatably fixed about each of said arms near the outer ends thereof, a plurality of curved scraper elements rotatably carried by said tubular frame and supported at their outer ends by said arms, said scrapers and rollers being adapted to move in unison about said tubular frame member in a horizontal plane spaced upwardly from the lower limit of said tubular frame member, a trough carried by an upper part of said frame member and extending therefrom to a point outside the silo through an opening therein, a series of sprockets disposed within the lower end of said frame member below said arms and scrapers, at the junction of said trough and tubular frame member, and at the outer end of said trough, an endless chain and paddle conveyor passing over said sprockets, whereby said chain and paddles move through the tubular frame member and over and under the trough member, means including a winch for suspending said tubular frame member within said silo to permit vertical movement of the same, power means including a motor for rotating said scrapers about said tubular frame, coupling means for driving said endless chain conveyor at a rate proportional to the rate of rotation of said arms, a second coupling means for moving said tubular frame member longitudinally within the silo through said winch at a rate proportional to the rate of rotation of said scrapers, and switching means outside the silo operably connected to said motor.

6. An apparatus for use in a silo comprising a central tubular conveyor frame, a laterally extending conveyor trough extending between the upper end of said tubular conveyor frame and the silo wall, an endless chain and paddle conveyor operating within said tubular frame and over and under said trough, a rotatable collar about said tubular frame, radial arms rotatably carried by said collar about said tubular frame, and a plurality of curved scraper elements fixed to said collar and supported at their outer ends by said arms, said scrapers being adapted to move about said tubular frame in a horizontal plane above the lower limit of travel of said paddles, a shaft and sprocket below said scrapers within said tubular frame over which said endless chain passes, and cutters fixed to said shaft outside of said tubular frame adapted to cut a well in the silo solids to accommodate the lower end of the tubular frame and provide a bite for said scrapers and paddles.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,233,308	Burgess	July 17, 1917
1,479,990	Keys	Jan. 8, 1924
1,550,311	Foster	Aug. 18, 1925
1,740,250	Kutz, Sr. et al.	Dec. 17, 1929
2,277,879	Ness et al.	Mar. 31, 1942
2,445,056	Cordis	July 13, 1948

FOREIGN PATENTS

Number	Country	Date
110,384	Germany	May 10, 1900