

C. E. BATHRICK.
HOISTING AND DUMPING APPARATUS.
APPLICATION FILED JAN. 20, 1912.

1,248,600.

Patented Dec. 4, 1917.

3 SHEETS—SHEET 1.

Fig. 1.

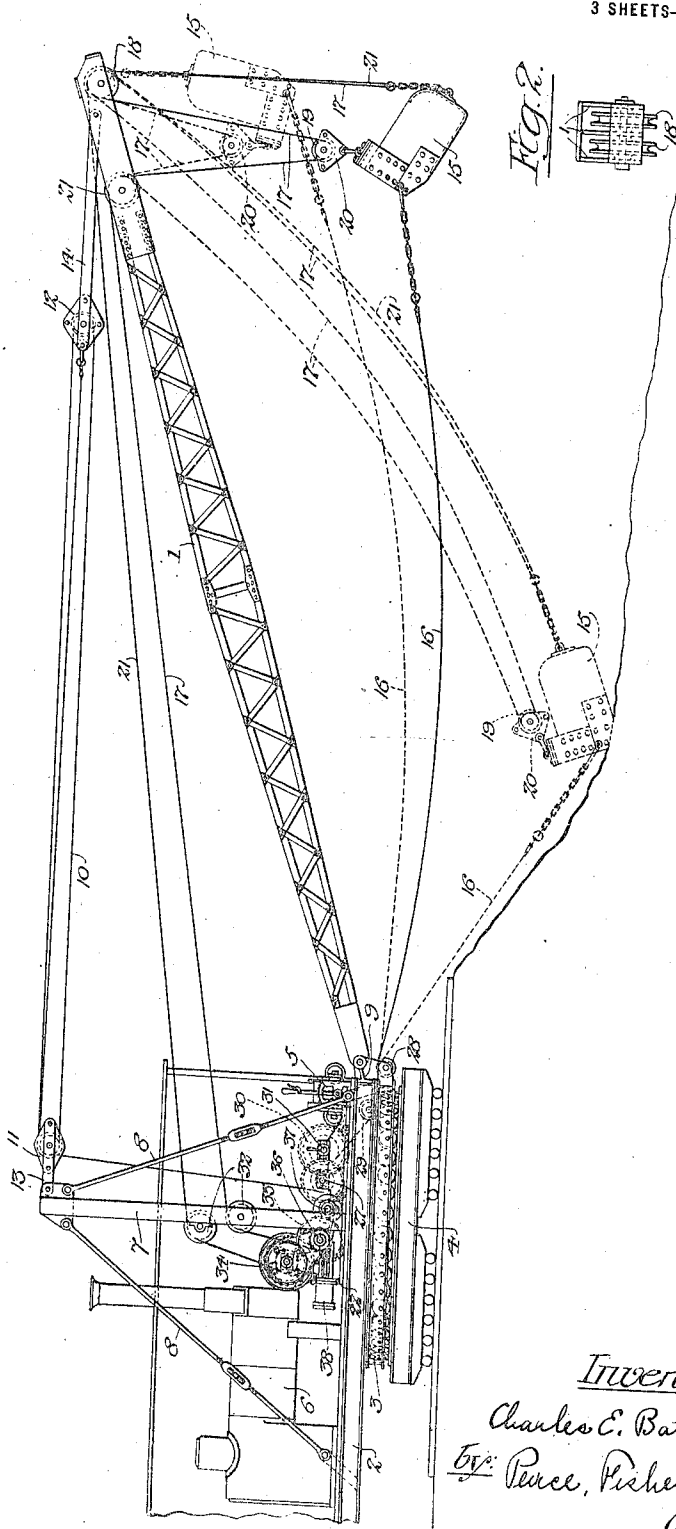
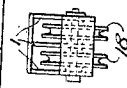


Fig. 2.



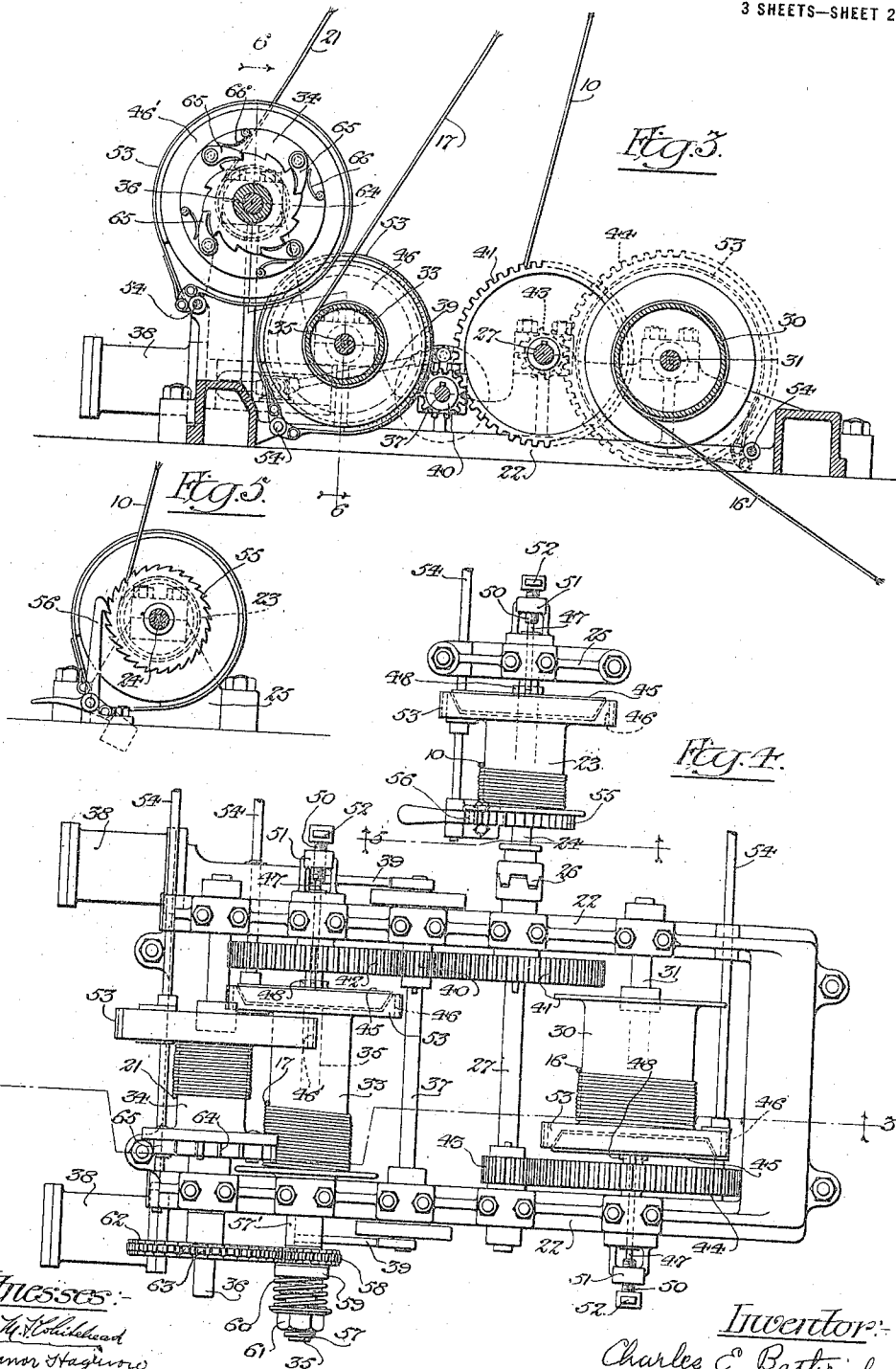
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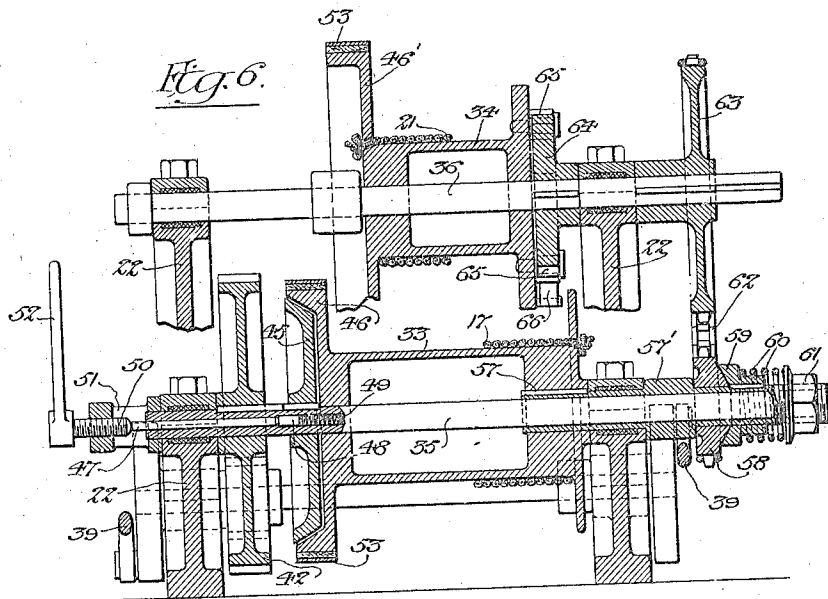
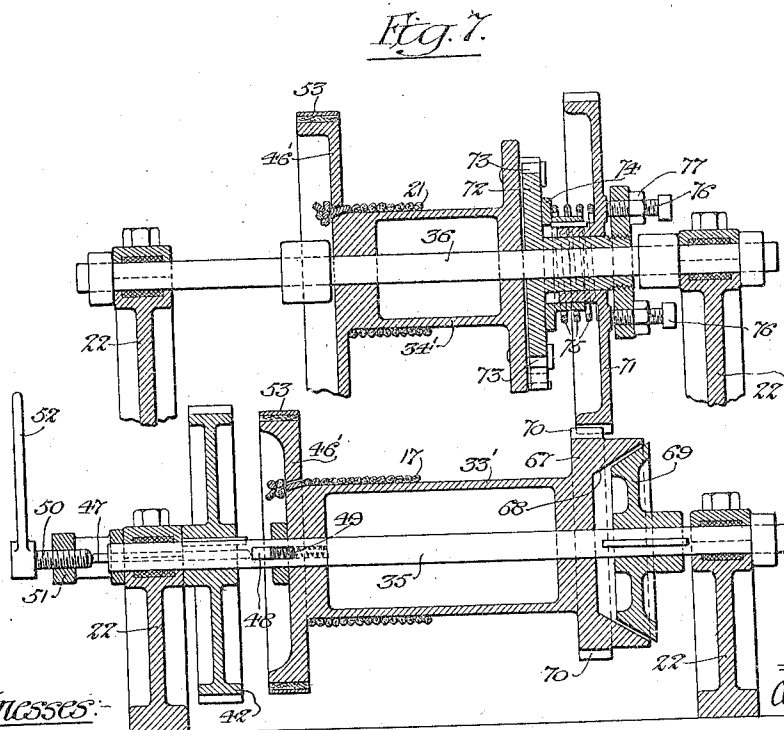
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3 SHEETS—SHEET 3.

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HOISTING AND DUMPING APPARATUS.

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To all whom it may concern:

Be it known that I, CHARLES E. BATHRICK, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Hoisting and Dumping Apparatus, of which the following is a full, clear, and exact description.

The present invention relates to hoisting and dumping apparatus and more particularly to such as are employed for operating excavating buckets or scoops. Ordinarily, in such apparatus, the separate hoisting and dumping lines are maintained in proper relation through the medium of separate, manually operated clutches that control the winding drums of these lines. The present invention seeks to provide improved means for automatically maintaining the hoisting and dumping lines in proper relation, and which is so arranged that the winding of the separate lines may be effected under control of a single clutch. The invention also seeks to provide an improved arrangement of the hoisting and dumping lines and of the operating means therefor.

In the drawings, Figure 1 is a view in side elevation of an excavating and hoisting machine embodying the present invention. Fig. 2 is an elevation of the end of the boom of the apparatus. Fig. 3 is a vertical section of the winding drums and drive mechanism therefor taken on the line 3—3 of Fig. 4. Fig. 4 is a plan view of the winding drums and operating mechanism. Fig. 5 is a detail section on the line 5—5 of Fig. 4. Fig. 6 is a vertical section on the line 6—6 of Fig. 3. Fig. 7 is a view similar to Fig. 6 illustrating a modification.

While the present invention is applicable to hoisting and excavating apparatus having various ways of supporting the load carrying device or bucket, the latter, in the form shown, is supported from the outer end of a boom 1 which in turn is carried upon a frame 2. The frame 2 is rotatably sustained by a turn-table 3 and the latter is mounted upon a base 4 of any suitable description. A motor driven mechanism of any suitable form (indicated at 5 in Fig. 1,) is employed for effecting the rotation of the frame 2. The frame 2, in the form shown, carries a boiler 6 which supplies steam to the turn-table motor mechanism 5 and to the motor for operating the winding drums.

A mast 7 rises from the frame 2 and inclined braces 8 extend between the frame and the upper end of the mast. The boom 1 is pivotally connected at its inner end to a bracket 9 on one end of the frame 2 and its outer end is sustained and raised and lowered by a boom line 10. The boom line 10 passes over the pulleys of a pair of blocks 11 and 12 and straps 13 and 14 connected to these blocks are pivotally connected respectively to the upper end of the mast and to the outer end of the boom. The load carrying device shown is in the form of a bucket or scoop 15 closed at its rear end and open at its forward end and adapted to be filled when drawn along over the material by a drag line 16 connected to the lower front portion of the bucket. Hoisting and dumping lines are provided for the bucket and these lines may be variously arranged. Preferably, however, the end of the hoisting line 17 is connected to the rear end of the bucket, passes upwardly over one of a pair of pulleys 18 on the outer end of the boom 2, thence downwardly over the pulley 19 of a fall-block 20 and thence upwardly over another pulley 21 on the boom. The fall-block 20 is connected to the upper forward portion of the bucket and the arrangement is such that when the bucket is raised clear of the ground, it will ordinarily assume the position shown in full lines in Fig. 1, so that the contents will not be spilled from its open forward end. With the preferred arrangement set forth, the hoisting line has a single supporting portion connected to the rear end of the bucket, and a double supporting portion connected to the upper forward portion of the bucket, the pulley 19 of the fall-block 20 resting in the bight of the double supporting portion. In the preferred arrangement shown, the dump line 21 is connected to the rear end of the bucket and extends upwardly over the second pulley 18 at the outer end of the boom.

A frame 22 is mounted upon the main frame 2 (see Figs. 3 and 4) and carries the winding drums for the several lines or cables and the operating mechanism for the drums. The hoisting line 10 passes over a drum 23 on a shaft 24. One end of this shaft is journaled in a bracket 25 and its opposite end is connected by a coupling 26 to a counter-shaft 27 that is journaled in the frame 22.

The drag line 16 passes over a pair of guide pulleys 28 and 29 (see Fig. 1) and thence over a drum 30 upon a shaft 31. The hoisting and dumping lines 17 and 21 pass over a pair of guide pulleys 32 on the mast 7 (see Fig. 1) and thence over a pair of drums 33 and 34 which are mounted, respectively, upon shafts 35 and 36. The shaft 31 which carries the drag line drum 30 is journaled at one end of the frame 22 and the shafts 35 and 36 which carry the hoisting and dumping line drums are journaled at the opposite end of the frame with the shaft 36 above the shaft 35.

A main drive shaft 37 is journaled in the central portion of the frame 22 and in the form shown is driven by a pair of motor cylinders 38 mounted on the frame and connected by pitman rods 39 to the opposite ends of the main drive shaft 37. A pinion 40 on one end of the main drive shaft meshes with gears 41 and 42 which are keyed, respectively, to the counter-shaft 27 and to the drum shaft 35. At its opposite end the counter-shaft is provided with a pinion 43 which meshes with a gear 44 keyed to the drum shaft 31.

By means of this gearing, the shafts 24, 31 and 35 are continuously driven from the shaft 37 when the machine is in operation. The winding drums 23, 30 and 33 for the boom, drag and hoisting lines are loosely mounted on these shafts, but are coupled thereto, as desired, by suitable friction clutches. These friction clutches may be of any suitable construction. Those shown are all alike and each comprises a disk 45 keyed to the shaft and longitudinally shiftable thereon into and out of engagement with a friction wheel 46 upon the adjacent drum, the disk and wheel being provided with cooperating conical surfaces. A longitudinally extending shifter rod 47 (see Fig. 6) extends axially through the corresponding shaft and its inner end engages a key 48 that extends transversely through a slot in the shaft. The ends of the key 48 which project beyond the shaft engage the hub of the friction disk 45. The rod 47 and the key 48 are pressed outwardly to relieve pressure on the friction disk 45 by means of a spring 49 arranged in the bore of the shaft and engaging a key 48. The outer end of the shifter rod is engaged by a screw 50 which is threaded through a fixed bracket 51 and is provided with an operating lever or handle 52. By manipulating the levers or handles 52 of the several clutches, the drums 23, 30 and 33 may be connected, as desired, to their respective shafts to wind up the boom line 10, drag line 16 and hoisting line 17. They may also be readily disconnected from the shafts to permit the unwinding of these lines.

To control the unwinding of the lines, a friction brake band 53 surrounds the fric-

tion wheel 46 of each drum and these brake bands are controlled in the usual manner by a series of operating shafts 54. In addition to the brake, the boom line drum 23 is provided at one end with a ratchet wheel 55 which is arranged to be engaged by a locking dog 56 which, when in operative position, prevents the unwinding of the drum 23 and holds the boom of the apparatus at any desired elevation.

The drum 34 for the dump line (see Fig. 6) is provided with a friction wheel 46' having, like the wheels of the other drums, a brake band 53 surrounding the same to control the unwinding movement of the drum. This drum, however, is not provided with a friction clutch, but is connected to the hoisting drum 33 and is thrown into operation therewith. For this purpose one end of the hoisting drum 33 (see Fig. 6) is keyed to one end of a sleeve 57 which extends through a bearing in the side frame 22. Beyond the bearing the sleeve is provided with an enlarged portion 57' which abuts against the bearing. A sprocket wheel 58 is loosely mounted upon the outer end of the sleeve and abuts against the enlarged portion 57' thereof. Beyond the sprocket wheel the sleeve 57 is provided with a friction disk 59 which is keyed to the sleeve, but which is longitudinally shiftable thereon. The sprocket wheel 58 and friction disk 59 are provided with cooperating conical friction surfaces which are yieldingly pressed into engagement by a spring 60 coiled about the hub of the friction disk 59 and extending between the disk and an adjusting nut 61 threaded on the end of the sleeve 57. This friction device forms an automatically yielding or slipping connection between the hoisting drum 33 and the sprocket 58 which drives the dump line drum 34.

The sprocket 58 is connected by a chain 62 to a large sprocket wheel 63 that is keyed upon one end of the shaft 36. A ratchet 64 also keyed to the shaft is arranged to be engaged by a series of pawls 65 (see Fig. 3) which are pivotally mounted upon the end of the drum 34 and which are pressed by springs 66 into engagement with the ratchet wheel 64.

In hoisting the bucket the drum 33 is coupled to the shaft 35 by its friction clutch to wind up the hoisting line 17 and this hoisting drum drives the drum 34 at the same time to wind up the dump line 21 through the medium of the automatically yielding friction device and the pawl and ratchet mechanism. If there is any slack in the hoisting line, the weight of the drum will be thrown upon the dump line, but under such circumstances, the friction disk 59 will slip on the face of the cooperating sprocket wheel 58 so that the slack in the hoisting line will be taken up. The pawl

and ratchet mechanism interposed between the hoisting and dump line drums permits the unwinding movement of the hoisting drum while the dump line drum is held stationary.

In operation, the bucket is lowered by permitting the unwinding movement of the hoisting and dump line drums 33 and 34 under control of their brake bands. The bucket is filled by throwing the drag line drum 30 into operation to draw the bucket forwardly, as indicated in dotted lines in the lower portion of Fig. 1. The bucket is then hoisted by clutching the hoisting line drum 33 to this shaft and, as stated, this drum also drives the dump line drum 34. When the bucket is clear of the ground, it assumes the position shown in full lines in Fig. 1, so that it will not dump its load. The gearing between the drums is such that the tendency is to drive the dump line slightly faster than the single supporting portion of the hoisting line 17, but the dump line will not thereby lift the rear end of the bucket since by doing so, an excessive strain will be brought on the dump line and the automatically yielding or slipping device in the drive gearing of the dump line drum will yield under such excessive strain. By this arrangement, the slack in both the hoisting and dumping lines will be taken up.

When the bucket has been hoisted to the desired height, and the boom 1 swung to bring the bucket over the point at which it is to be dumped, the clutch of the hoisting line drum 33 is thrown out of operation and the hoisting line 17 is permitted to unwind under control of the brake of its drum. At the same time, the brake of the dump line drum 34 is thrown into operation to prevent the unwinding of the dump line 21. The dump line will then hold up the rear end of the bucket and the unwinding movement of the hoisting line will lower the forward end thereof, so that the bucket will be dumped, as indicated in dotted lines in the right hand portion of Fig. 1. The bucket will then be again lowered by paying out both the hoisting and dumping lines. The unwinding movement of the hoisting line 17 in dumping the bucket renders it slack relatively to the dump line, but, as stated, when the bucket is again hoisted this slack in the hoisting line will bring an excessive strain upon the dump line, causing the slipping of the friction device between the hoisting and dumping line drums, so that the slack in the hoisting line will be properly taken up. As stated, the pawl and ratchet connection between the hoisting and dump line drums permits the free unwinding movement of the hoisting line in dumping the bucket.

The clutch mechanism and the connection between the hoisting and dump line drums may be widely varied. In the form shown

in Fig. 7, the hoisting drum 33' is longitudinally shifted upon its shaft 35 by the shifter rod 47 and key 48 to throw it into operation. In this form the drum 33' is provided with a head 46' arranged to be engaged by a brake band 53 and at its opposite end is provided with a friction head 67 having a conical recess in its outer face which is arranged to engage a conical friction wheel 69, keyed to the shaft 35. The head 67 is provided with gear teeth 70 which mesh with the teeth of a gear 71 loosely mounted upon the hub of a ratchet wheel 72 on the dump line drum shaft 36. This ratchet wheel, like the ratchet wheel 64 is arranged to be engaged by pawls 73 on the adjacent head of the dump line drum 34'.

In this form, the ratchet wheel 72 is keyed to the shaft 36 and is connected to the drum 34' by the pawls 73, as described. The gear 71 is, as stated, loosely mounted upon the hub of the ratchet wheel 72 and the automatically yielding or slipping friction device is interposed between the gear and the ratchet wheel. It comprises a friction disk 74, the hub of which is keyed to the hub of the gear 71, but is free to slide thereon. A spring 75 coiled about the hub of the friction disk extends between the disk and the inner face of the gear and tends to press the disk into frictional engagement with the face of the ratchet wheel 72. A disk 76 threaded upon the outer end of the hub of the ratchet wheel has a series of adjusting screws 77 threaded therethrough into engagement with the outer face of the gear 71 and these screws are provided with lock nuts 78. By manipulating these screws, the tension of the spring is adjusted to exert the desired amount of pressure upon the disk 74. The friction device in this form, as well as in the other form, is so adjusted that it will slip when there is slack in the hoisting line and excessive strain brought upon the dump line.

By the improved arrangement set forth, the separate hoisting and dumping lines are automatically maintained in proper relation and the winding of both lines is effected under control of a single clutch, so that the hoisting and dumping operations may be rapidly effected.

I claim as my invention:

1. In a hoisting and dumping apparatus, the combination of a hoisting line and a dumping line, winding drums for said lines, means for driving one of said drums, connecting gearing interposed between said drums, said gearing including an automatically yielding, friction drive mechanism and a pawl and ratchet mechanism and a brake for holding said dumping line drum against movement, substantially as described.

2. In a hoisting and dumping apparatus, the combination of hoisting and dumping lines, separate winding drums for said lines,

parallel supporting shafts for said drums, brakes for independently holding said drums against movement, a common drive shaft, a clutch for connecting said shaft to one of
5 said drums, a connecting gearing between said drums, said gearing including pawl and ratchet mechanism and automatically yielding, friction drive mechanism, substantially as described.

10 3. In a hoisting and dumping apparatus, the combination with hoisting and dumping lines, of winding drums for said lines, parallel supporting shafts for said drums, drive mechanism for said hoisting line drum, con-

necting drive gearing between said drums, 15 said gearing including an automatically yielding friction device to permit the slipping of said dump line drum and a pawl and ratchet mechanism to permit the independent unwinding movement of said hoist- 20 ing line drum, and brakes for independently holding said drums against movement, substantially as described.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."