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COMBINED CONVEYOR AND EXCAVATOR

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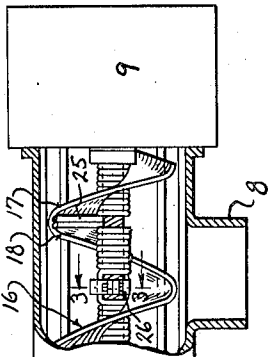


Fig. 1.

Fig. 4.

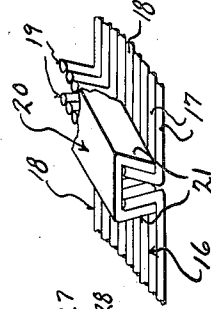


Fig. 3.

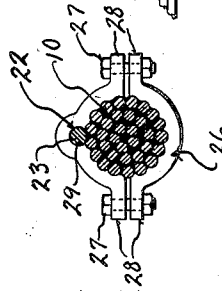
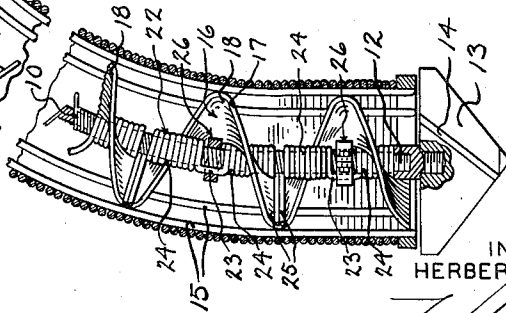
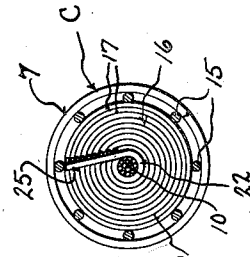
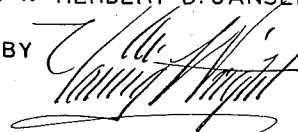


Fig. 2.



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COMBINED CONVEYOR AND EXCAVATOR

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3 Claims. (Cl. 37—189)

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This invention appertains to excavators and conveyors, and more particularly to screw conveyors used to excavate, handle and convey earth, concrete, grain, or any other granular or pulverulent material from a lower to a higher level, or vice versa.

One of the primary objects of my invention is to provide a combined excavator and conveyor having conveying elements of a continuous flexible nature, whereby to permit the conducting of material around bends and curves and to permit the expeditious use of the excavator and conveyor in confined quarters.

Another salient object of my invention is to provide a combined excavator and conveyor so constructed that one operating means can be effectively employed to motivate both the excavator and the conveyor elements.

A further object of my invention is to provide a flexible casing having rotatably mounted axially therein a flexible shaft having coupled to its forward end an excavating head and arranged around its length a spiral flexible flight or screw for conveying the material excavated by the head through the casing.

A further object of my invention is to provide novel means for constructing the spiral flight or screw conveyor and novel means for supporting and bracing the conveyor on the flexible shaft.

A further important object of my invention is to provide novel means for constructing the flexible shaft and the flexible flight or screw in sections to facilitate assembly and to provide novel means for connecting the sections of the flight together.

A still further object of my invention is to provide novel internal ribs for the flexible conveyor casing, said ribs functioning as rifling to facilitate the movement of material therethrough and to brace the casing.

A still further object of my invention is to provide a combined excavator and conveyor of the above character, which will be durable and efficient in use, one that will be simple and easy to manufacture, and one which can be placed upon the market at a reasonable cost.

With these and other objects in view, the invention consists in the novel construction, arrangement, and formation of parts, as will be hereinafter more specifically described, claimed and illustrated in the accompanying drawing, in which drawing:

Figure 1 is a side elevational view of my combined excavating and conveying device, parts of the view being shown broken away and in section to illustrate structural detail.

Figure 2 is a diametric sectional view through the flexible conveyor taken substantially on the line 2—2 of Figure 1, looking in the direction of the arrows, the view illustrating more particu-

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larly the novel means for bracing the conveyor flight from the flexible shaft.

Figure 3 is an enlarged detail sectional view taken through the flexible shaft substantially on the line 3—3 of Figure 1, looking in the direction of the arrows, illustrating the means employed for clamping the flight bracing means to the flexible shaft, and

Figure 4 is an enlarged fragmentary detail perspective view illustrating one preferred means for detachably connecting the adjacent ends of sections of the flight together.

Referring to the drawing in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter C generally indicates my combined excavating and conveying machine, and the same includes a rigid supporting case 5 which can be secured, if so desired, on any type of elevated supporting structure. The casing 5 can be of a cylindrical nature and its forward end has coupled thereto, as at 6, a flexible cylindrical casing 7. The rigid supporting casing 5 can be provided with a depending outlet neck 8. The casing can also have secured thereto a drive motor 9, the purpose of which will be later set forth.

The flexible casing 7 can be of the same nature as the flexible pipes or tubing now found on the open market and the coupling 6 employed for connecting the casing 7 to the rigid casing 5, can also be of a type now found in the open market.

Extending axially through the flexible casing 7 and the rigid casing 5 is a flexible drive shaft 10. This shaft 10 can also be of any desired type now found in the open market, but preferably consists of layers of closely wound flexible or resilient wire. The shaft 10 is made in sections of a desired length and the sections are detachably connected together by couplings 11. The extreme forward end of the flexible shaft has detachably connected thereto, by a coupling 12, a cutting and excavating head 13. The head can be of a cone shape and provided with spiral cutting blades 14. As is clearly shown in Figure 1, this cutting head is arranged directly in advance of the flexible casing 7. The rear end of the shaft is connected directly to the armature shaft of the motor 9 or reducing gearing can be interposed between the motor 9 and the flexible shaft, as may be desired.

Secured to the inner face of the casing 7, at spaced points, are resilient wires or rods 15, and these wires extend into the rigid casing 5 and are rigidly fastened to the inner surface thereof. These rods 15 constitute rifling for facilitating the movement of material through the casing and the rods also function to brace the casing 7 longitudinally.

One of the important features of my invention is the spiral flight or screw conveyor 16

which is carried by the flexible shaft 10, and this conveyor is of a flexible nature so that the same will readily conform to the bending of the casing 7 and the flexible shaft 10. The conveyor is composed of a series of resilient or flexible rods 17 placed longitudinally against one another to form a blade or flight and the resultant structure is bent to form the spiral flight or screw conveyor.

To facilitate assembly, the flight is made up of a plurality of sections 18 and the ends of the sections are bent outwardly to provide diverging flanges 19. The flanges 19 are coupled together by slide bars 20, as is best shown in Figure 4. The slide bars 20 are provided with inwardly inclined side walls 21 which receive flanges 19.

In order to connect and to brace the flight or screw conveyor on the shaft 10, I employ a series of bracing elements 22. These bracing elements 22 are formed from resilient wire and each include a central U-shaped bight portion 23 and oppositely extending coiled sleeves 24. The terminals of the sleeves end in outwardly extending arms 25 which engage the inner adjacent face of the conveyor. The arms 25 can be secured to the flight sections 18 if desired. Thus, the arms extend transversely across a flight and the bracing and connecting elements 22 are so arranged that the bracing arm of one element will engage the adjacent bracing arm of the next element.

Two part sectional clamps 26 are employed for connecting each bracing element to the flexible shaft and the sections of the clamping collars are secured around the flexible shaft by bolts 27 which extend through ears 28 formed on the sections of the collars. The sectional collars also embrace and hold the bight portion 23 of a clamping element 22 and the inner face of the collar can be grooved as at 29 to receive this bight portion.

In operation of my device, the cutting head 13 will cut and break up the material to be excavated and will deposit the material on the forward or initial screw flight and as the flight receives the material, the conveyor will advance and carry the material into the rigid casing 5. The material will flow out of the neck or spout 8. The cutting head 13 can be in the nature of a drill, or cutter of the rotary plow or reamer type.

The rods or rifling 15 will form a deterrent to the circumferential motion of the material to be conveyed. This will increase the efficiency of the screw in achieving an upward movement of the material.

Obviously, my device can be used as a loading or unloading device for freight cars or automobile trucks and if the device is mounted on a truck, the same can be driven from the power plant of the truck.

From the foregoing description, it can be seen that I have provided simple and efficient means for excavating material and for conveying such material from one point to another.

Changes in detail may be made without departing from the spirit or the scope of my invention, but what I claim as new is:

1. A combined excavator and conveyor comprising a flexible casing, a flexible shaft arranged axially in the casing for rotation, means for rotating the shaft, an excavating head secured to the forward end of the shaft for rotation therewith and a spiral flight carried by the shaft for rotation therewith arranged in said conveyor, said flight including a plurality of resilient wires, and said flight being formed in sections, the terminals of the sections being provided with flanges and slide clamps detachably fitted over said flanges for uniting the sections together.

2. A combined excavator and conveyor comprising a flexible casing, a flexible shaft disposed axially in the casing for rotation, means for rotating the shaft, a cutter and excavating head secured to the forward end of the shaft for rotation therewith and a spiral screw conveyor on said shaft arranged within the casing, means for connecting the conveyor to the shaft and for bracing the flights thereof, including bracing and clamping elements, each having a central substantially U-shaped bight portion and outwardly extending coil sleeves, sectional clamps for connecting the bight portions to the flexible shaft and outwardly extending arms on the terminals of the coil sleeves, engaging the conveyor at spaced points.

3. A combined excavator and conveyor, comprising a flexible casing, a flexible shaft axially disposed in the casing, an excavating head secured to the forward end of the shaft for rotation therewith, a spiral conveyor secured to the shaft and brace bars secured to the inner face of the flexible casing extending longitudinally thereof and cooperating with the conveyor to facilitate movement of material through the casing.

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