May 17, 1938. J. CORSER 2,117,300

ROCK CRUSHING MACHINE

Filed Dec. 13, 1935 4 Sheets-Sheet 1

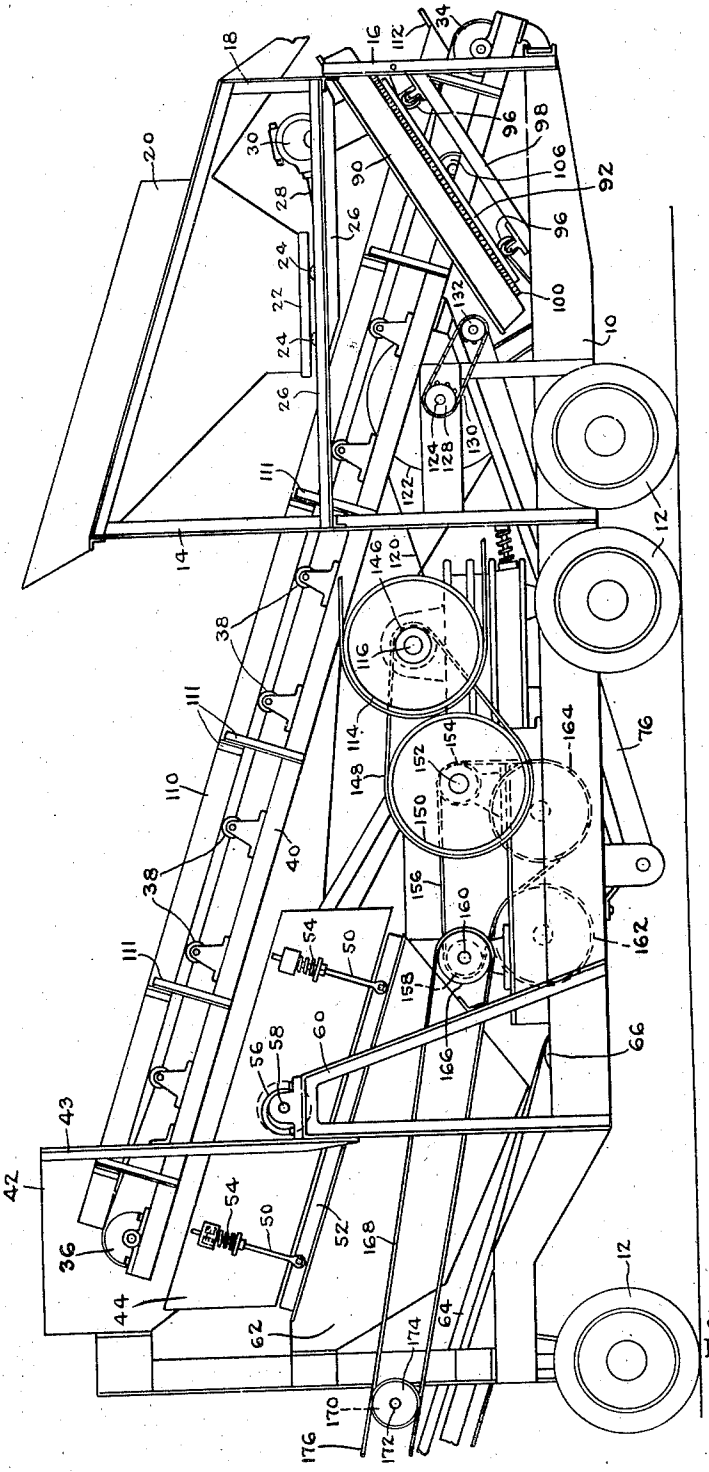


Fig. 1.

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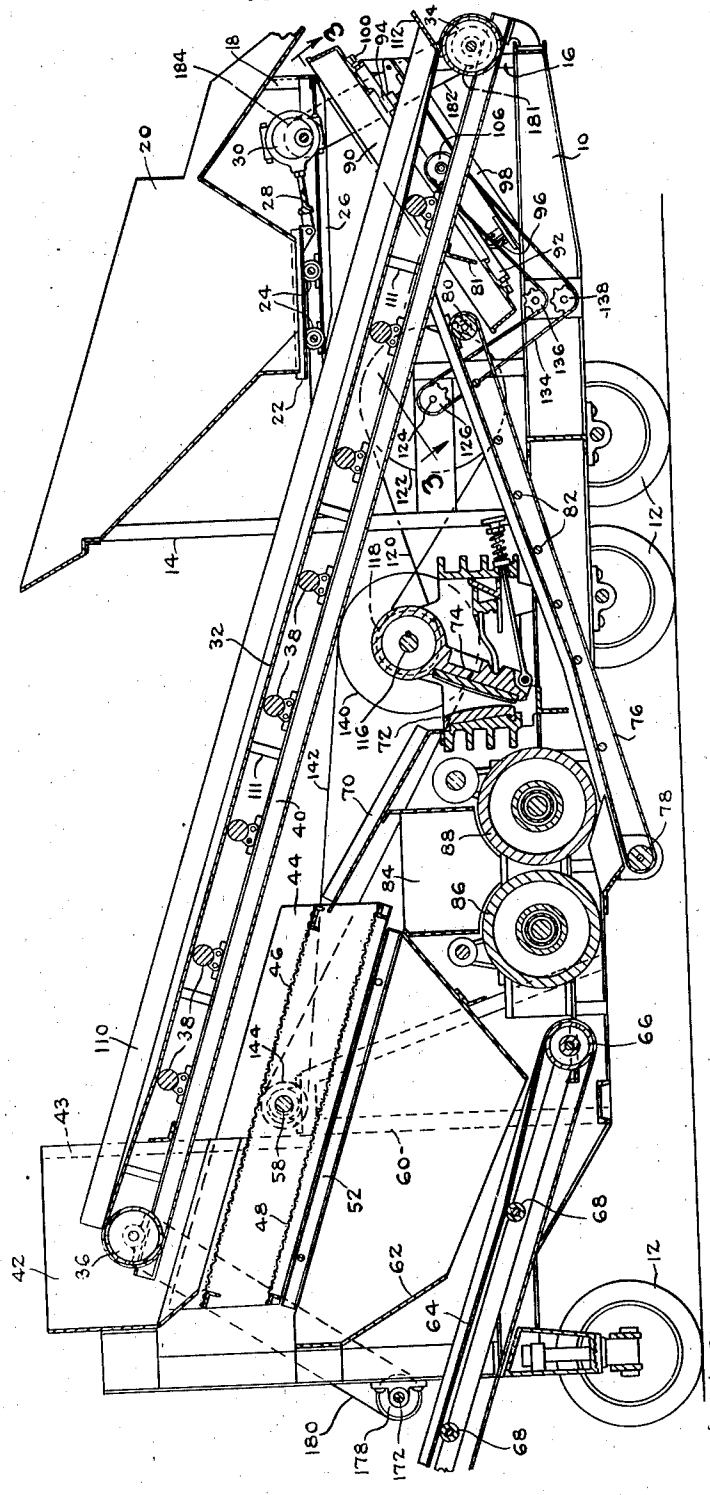


Fig. 2

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Fig. 3

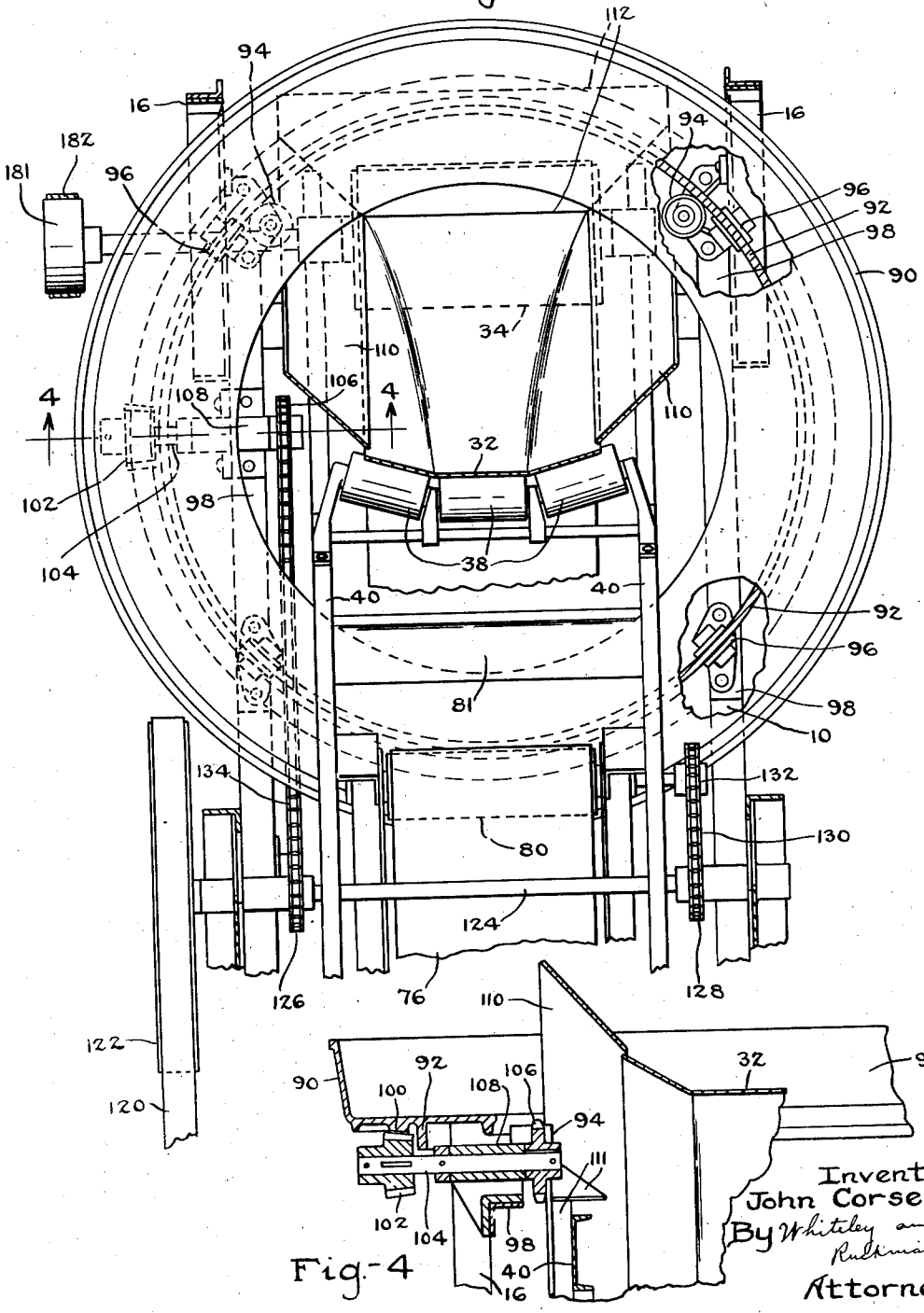


Fig. 4

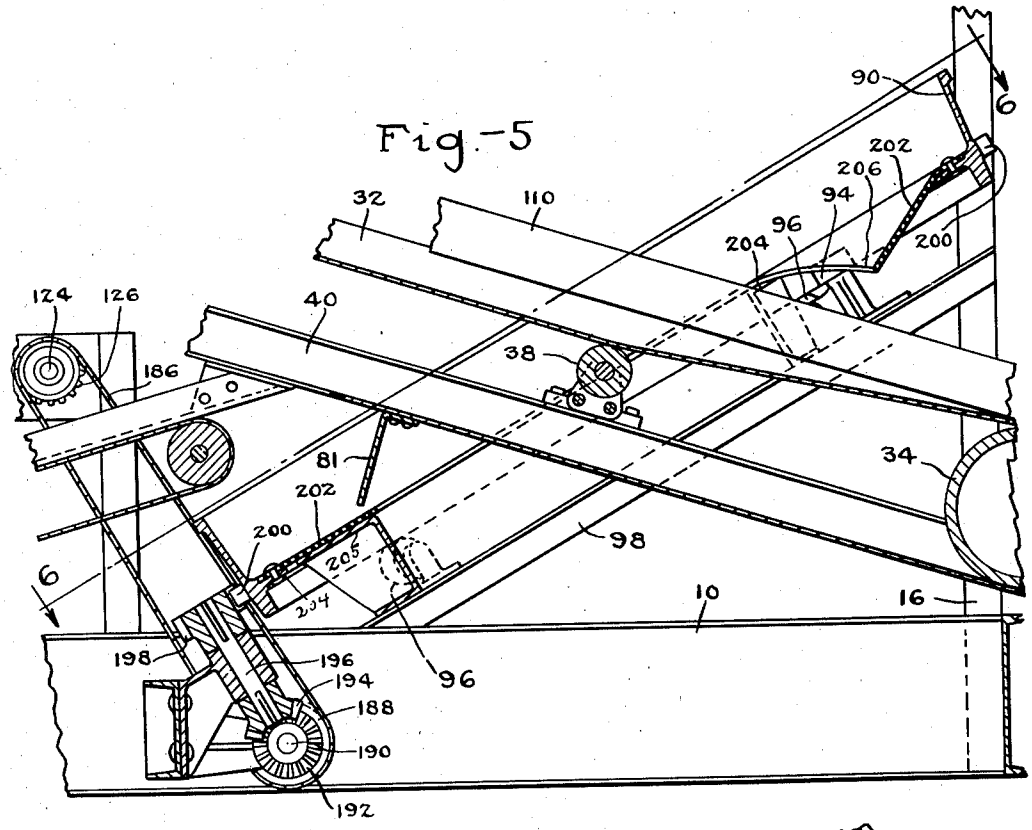
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ROCK CRUSHING MACHINE

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Fig-5



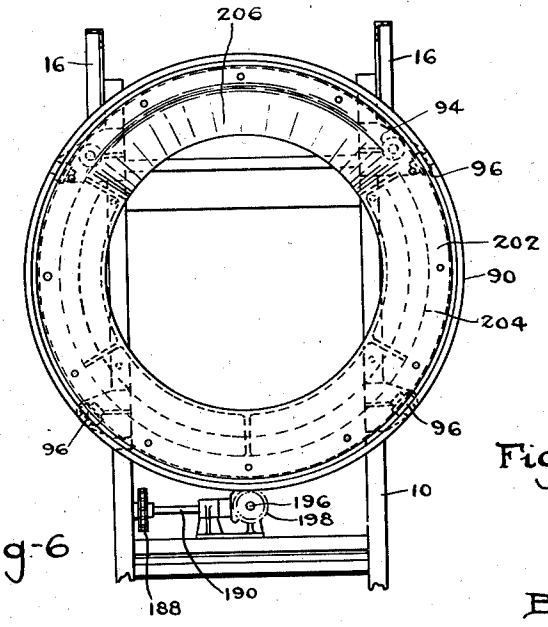


Fig-6

Fig-7

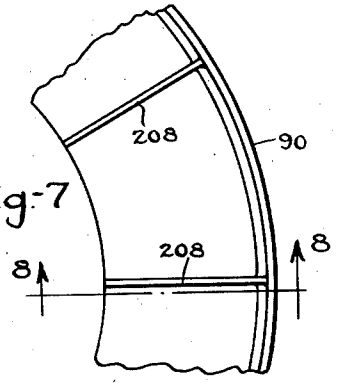
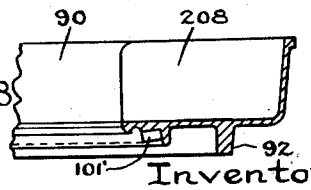


Fig-8



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Patented May 17, 1938

2,117,300

UNITED STATES PATENT OFFICE

2,117,300

ROCK CRUSHING MACHINE

John Corser, Minneapolis, Minn., assignor to Diamond Iron Works, Incorporated, Minneapolis, Minn.

Application December 13, 1935, Serial No. 54,252

6 Claims. (Cl. 83—93)

My invention relates to rock crushing machines and more particularly to a machine of this character which is so constructed and arranged that it may be readily transported from place to place for use in operative work located at widely separated places, as in road construction work. The term "rock crushing" is used in a broad sense and is intended to designate a machine capable of crushing in addition to rock and stones used in construction work, other material such as ore for instance.

Among the objects of my invention are the provision of a machine which can be transported with safety on account of low center of gravity and low structure and which has great rock crushing capacity and provision for delivering the crushed rock free from oversize pieces.

In the operation of my machine, the rock to be crushed is delivered in any suitable manner to an endless conveyor which delivers to a screening device through which the portion of the material which is of standard degree of fineness falls upon a take-away conveyor. Portions of the material too coarse to pass through the screening device are delivered to crushing mechanism which reduces the size of the pieces.

This crushed material is fed to an open center inclined saucer-like conveyor which delivers to the original endless conveyor so as to again pass this material to the screening device whereby any oversize pieces are prevented from going to the take-away conveyor. In order to most conveniently feed the crushed material from the saucer-like conveyor to the original endless conveyor, the latter runs through the open center of the former, so that when the material in the saucer-like conveyor during its rotation reaches the highest point thereof, it slides out upon the endless conveyor. By means of this construction, I am able to provide a compact machine having a low center of gravity and of low structure so that it may be readily transported from place to place as the character and location of the work makes desirable.

As a specific embodiment of my broad inventive idea, the screening device consists of a screen frame having an upper coarse screen and a lower finer screen, portions of the material too coarse to pass through the upper screen being delivered to a jaw crusher, and further portions too coarse to pass through the lower screen being delivered to a roll crusher. The material from both of these crushers is delivered by an endless conveyor to the saucer-like conveyor.

The full objects and advantages of my invention will appear in connection with the detailed description thereof, and the novel features embodied in my invention will be particularly pointed out in the appended claims.

In the accompanying drawings which illustrate the application of my invention in slightly different forms:

Fig. 1 is a side elevational view of the machine. Fig. 2 is a view in central vertical section. Fig. 3 is a view in section on the line 3—3 of Fig. 2 on an enlarged scale. Fig. 4 is a view in section on the line 4—4 of Fig. 3. Fig. 5 is a sectional view of a modification, this view corresponding to a portion of Fig. 2 and being on an enlarged scale. Fig. 6 is a view in section on the line 6—6 of Fig. 5 but with an endless conveyor omitted. Fig. 7 is a fragmentary top plan view of a saucer-like conveyor. Fig. 8 is a view in section on the line 8—8 of Fig. 7.

Referring to the construction shown in the drawings, the numeral 10 designates the side frame members of the machine which are mounted on wheels 12 in order that the machine may be readily transported from place to place. The frame carries uprights 14, 16 and 18 as best shown in Fig. 1 which support a hopper 20 adapted to be supplied in any suitable manner with the material to be crushed. The bottom of the hopper is provided with a gate or slide 22 resting upon rollers 24 carried by a horizontal support 26. The gate 22 is connected by a pitman 28 with an eccentric 30 whereby the gate may be reciprocated to open and close the bottom of the hopper.

A flexible endless conveyor 32 below the hopper runs in an inclined position over a lower roller 34 and an upper roller 36, the upper stretch of this conveyor being supported on small rollers 38 carried by inclined frame members 40. The small rollers 38 have their top surfaces below the plane which extends between the top surfaces of the rollers 34 and 36 whereby the weight of material will give the upper stretch of the conveyor 32 a dished condition as best seen in Fig. 5. The upper end of the conveyor 32 delivers into a hopper 42 supported by standards 43 and underneath which is an inclined screen frame 44 carrying an upper screen 46 and a lower finer screen 48.

The screen frame 44 is supported at both sides by rods 50 which at their lower ends are pivoted to inclined frame members 52. Associated with the attachment of the rods 50 with the screen frame, are coiled springs 54 which permit the screen frame to have a compound swinging movement up and down and back and forth. This movement is imparted by eccentrics 56 secured to a shaft 58 mounted in bearings carried by standards 60 extending up from the main frame of the machine. The fine material or sand sometimes referred to as "fines", drops through both of the screens 46 and 48 into a hopper 62 underneath which is a flexible endless conveyor 64 passing around a lower roller 66 and a similar upper roller not shown. The conveyor 64 carries the fine material to the desired point of delivery, the upper stretch of the conveyor being supported

in the manner previously described by small rollers 68 whose top surfaces are below the plane which extends between the top surfaces of the rollers over which the conveyor runs.

The material which is too coarse to drop through the upper screen 46 passes off the lower end thereof to a chute 70 and between the fixed jaw 72 and swinging jaw 74 of a jaw crusher which delivers upon a flexible endless conveyor 76 passing around a lower roller 78 and an upper roller 80 ahead of which is a deflector plate 81 secured to the frame members 40. The upper stretch of the conveyor is supported by small rollers 82 in the manner previously described. The material which drops through the upper screen 46 but is too coarse to drop through the lower screen 48 passes off the lower end thereof into a box 84 from which it passes between the rolls 86 and 88 of a roll crusher which delivers upon the conveyor 76 previously referred to.

An important feature of the machine will now be described in detail. This includes what will be termed a saucer-like conveyor 90 having a depending circular flange 92 supported by rollers 94 engaging the inner surface of the flange and by vertical rollers 96 engaging the bottom edge of the flange. The rollers are carried by inclined supports 98 whereby the saucer-like conveyor 90 is supported for rotation in an inclined position. The conveyor outside of the circular flange 92 is provided with a ring gear 100 meshing with a pinion 102 secured to a shaft 104 to which is also secured a sprocket wheel 106. The shaft 104 is rotatable in a bearing 108 as shown in Fig. 4 and the sprocket 106 is rotated in a manner which will shortly be described.

As is apparent from Figs. 1 and 2, the upper end of the conveyor 76 delivers into the lower portion of the saucer conveyor 90. As will be understood from Figs. 2 and 3, the conveyor 90 has an open center and the conveyor 32 passes through this open center. Fixed side wall members 110 for the conveyor 32 also extend through said open center being supported by brackets 111 extending up from the frame members 40. The lower ends of the side wall members 110 are connected by a wall member 112. The material delivered by the conveyor 76 falls into the saucer conveyor 90 and is prevented from going out of its open center by the plate 81. When the material which is being carried up by the saucer conveyor reaches the uppermost position, it slides out upon the endless conveyor 32 as will best be understood from Fig. 2, from which figure it will be seen that the plate 112 keeps the material from falling off the lower end of the endless conveyor 32. As will be apparent from Figs. 3 and 4, the wall members 110 are inclined to deflect the material upon the conveyor 32.

The manner in which the various parts of the machine are driven will now be described. A driving pulley 114 which may be driven from any suitable source of power is secured to the power shaft 116 which operates the swinging crusher jaw 74. Secured to the shaft 116 as shown in Fig. 2 is a pulley 118 connected by a belt 120 with a pulley 122 secured to a shaft 124. Secured to the shaft 124 are two sprocket wheels 126 and 128. The sprocket 128 is connected by a sprocket chain 130 with a sprocket 132 which is secured to the shaft of the roller 80 by which the endless conveyor 76 is driven. The sprocket 126 is connected by a sprocket chain 134 with the sprocket 106 by which the saucer conveyor 90 is driven. As shown in Fig. 2, the sprocket chain has associated therewith two guide sprockets 136 and 138. Secured to the power shaft 116 is a pulley 140 which is connected by a belt 142 with a pulley 144 secured to the shaft of the eccentric 56 which operates the screen frame 44. Secured to the shaft 116 as shown in Fig. 1 is a pulley 146 connected by a belt 148 with a pulley 150 secured to a shaft 152 which has a smaller pulley 154 secured thereto. A belt 156 passes around a pulley 158 secured to a shaft 160 and this belt also passes around pulleys 162 and 164 secured respectively to the shafts of the roll crushers 86 and 88 and whereby these rolls are driven in the proper direction. Secured to the shaft 160 is a pulley 166 connected by a belt 168 with a pulley 170 secured to a shaft 172. A second pulley 174 secured to the shaft 172 is connected by a belt 176 with a pulley on the upper roller of the conveyor 64 by means of which this conveyor is driven. A third pulley 178 shown in Fig. 2 secured to the shaft 172 is connected by a belt 180 with a pulley on the shaft of the upper roller 36 of the conveyor 32. Secured to the shaft of the lower roller 34 of this conveyor is a pulley 181 connected by a belt 182 with a pulley 184 secured to the shaft of the eccentric 30 which reciprocates the gate 22.

The modifications shown in Figs. 5 to 8 will now be described. Referring to Fig. 5, it will be seen that the sprocket wheel 126 on the shaft 124 is connected by a sprocket chain 186 with a sprocket wheel 188 secured to a shaft 190. Secured to the shaft 190 is a bevel gear 192 meshing with a bevel gear 194 secured to a shaft 196 to the upper end of which is secured a pinion 198 which meshes with a ring gear 200 carried by the exterior of the saucer conveyor 90. The annular bottom of the saucer in this form is constituted by a flexible ring 202 secured at its outer margin to a circular interiorly projecting flange 204 formed on the saucer. The flexible ring 202 is supported for most of its circumference upon a rigid ring member 205 having a gap in its upper portion whereby the flexible bottom member 202 may sag downwardly at its portion indicated at 206 which comes uppermost as shown in Fig. 5 to readily discharge the material upon the endless conveyor 32. In Figs. 7 and 8, the annular bottom of the saucer is shown provided with upwardly extending partitions 208 to form pockets to prevent the material from passing around on the bottom of the saucer when the material comes into upper position. Fig. 8 shows that the ring gear 101' may be located inside of the circular flange 92 instead of being outside thereof as in Fig. 4.

The operation and advantages of my invention will be apparent from the foregoing description and to a large extent have already been indicated. The compact assembly of the machine whereby the structure is kept low is apparent from Figs. 1 and 2. The lower end of the endless conveyor 32 is very low down with the hopper positioned above the low portion. The endless conveyor needs to be inclined upwardly only sufficiently to provide for the screening and take-away devices. The crushing mechanism is placed very low upon the chassis or bed frame of the machine and underneath the intermediate portion of the endless conveyor 32. The saucer-like conveyor 90 is low down and by passing the lower portion of the conveyor 32 through the open center of the conveyor 90, the necessity of elevating any of the material to any considerable height is avoided.

I claim:

1. In a rock crushing machine, the combination of a screening device to which the material to be treated is delivered and through which the portions of the material which are sufficiently fine pass, crushing mechanism which receives the portions of material too coarse to pass through said screening device, means for delivering said portions that do not pass the screening device to said crushing mechanism, an inclined open center saucer-like conveyor for receiving the crushed material, receiving means passing through said saucer-like conveyor for delivering to said screening device, means for delivering the crushed material from said crushing mechanism to said saucer-like conveyor and means for rotating said saucer-like conveyor whereby the material carried upwardly thereby is delivered to said receiving means through said open center.

2. In a rock crushing machine, the combination of a screening device to which the material to be treated is delivered, said screening device having an upper coarse screen and a lower finer screen through both of which the portions of the material which are sufficiently fine pass, primary crushing means which receives the portions of the material too coarse to pass through said upper screen, secondary crushing means which receives further portions of the material too coarse to pass through said lower screen, means for delivering said portions that do not pass the screening device to the primary and secondary crushing means respectively, an inclined open center saucer-like conveyor for receiving all of the crushed material, receiving means passing through said saucer-like conveyor for delivering to said screening device, means for delivering the crushed material from said crushing means to said saucer-like conveyor and means for rotating said saucer-like conveyor whereby the material carried upwardly thereby is delivered to said receiving means through said open center.

3. In a rock crushing machine, the combination of an inclined endless conveyor upon which the material to be treated is deposited, a screening device to which the material is delivered from the upper end of said conveyor and through which the portions of the material which are sufficiently fine pass, crushing mechanism which receives the portions of the material too coarse to pass through said screening device, means for delivering said portions that do not pass the screening device to said crushing mechanism, an open center saucer-like conveyor for receiving the crushed material inclined in the opposite direction with relation to said endless conveyor and through the open center of which said endless conveyor runs, means for delivering the crushed material from said crushing mechanism to said saucer-like conveyor and means for rotating said saucer-like conveyor whereby the material carried upwardly thereby is delivered to said endless conveyor through said open center.

4. In a rock crushing machine, the combination of an inclined endless conveyor upon which the material to be treated is deposited, a screening device to which the material is delivered from the upper end of said conveyor, said screening device having an upper coarse screen and a lower finer screen through both of which the portions of the material which are sufficiently fine pass, primary crushing means which receives the portions of the material too coarse to pass through said upper screen, secondary crushing means which receives further portions of the material too coarse to pass through said lower screen, means for delivering said portions that do not pass the screening device to the primary and secondary crushing means respectively, an open center saucer-like conveyor for receiving all of the crushed material inclined in the opposite direction with relation to said endless conveyor and through the open center of which said endless conveyor runs, means for delivering the crushed material from said crushing means to said saucer-like conveyor and means for rotating said saucer-like conveyor whereby the material carried upwardly thereby is delivered to said endless conveyor through said open center.

5. In a rock crushing machine, the combination of an inclined endless conveyor upon which the material to be treated is deposited, a screening device to which the material is delivered from the upper end of said conveyor, said screening device having an upper coarse screen and a lower finer screen through both of which the portions of the material which are sufficiently fine pass, a jaw crusher which receives the portions of the material too coarse to pass through said upper screen, a roll crusher which receives further portions of the material too coarse to pass through said lower screen, means for delivering said portions that do not pass the screens to the jaw and roll crushers respectively, an open center saucer-like conveyor for receiving all of the crushed material inclined in the opposite direction with relation to said endless conveyor and through the open center of which said endless conveyor runs, means for delivering the crushed material from said crushers to said saucer-like conveyor and means for rotating said saucer-like conveyor whereby the material carried upwardly thereby is delivered to said endless conveyor through said open center.

6. In a rock crushing machine having a bed frame, the combination of an inclined endless conveyor upon which the material to be treated is deposited, the lower end of said endless conveyor being close to one end of said bed frame, a screening device to which the material is delivered from the upper end of said conveyor and through which the portions of the material which are sufficiently fine pass, said screening device being supported above the other end of said bed frame, crushing mechanism supported by said bed frame underneath the intermediate portion of said conveyor and which receives the portions of the material too coarse to pass through said screening device, means for delivering said portions that do not pass the screening device to said crushing mechanism, an open center saucer-like conveyor for receiving the crushed material inclined in the opposite direction with relation to said endless conveyor and through the open center of which said endless conveyor runs, means for delivering the crushed material from said crushing mechanism to said saucer-like conveyor and means for rotating said saucer-like conveyor whereby the material carried upwardly thereby is delivered to said endless conveyor through said open center.

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