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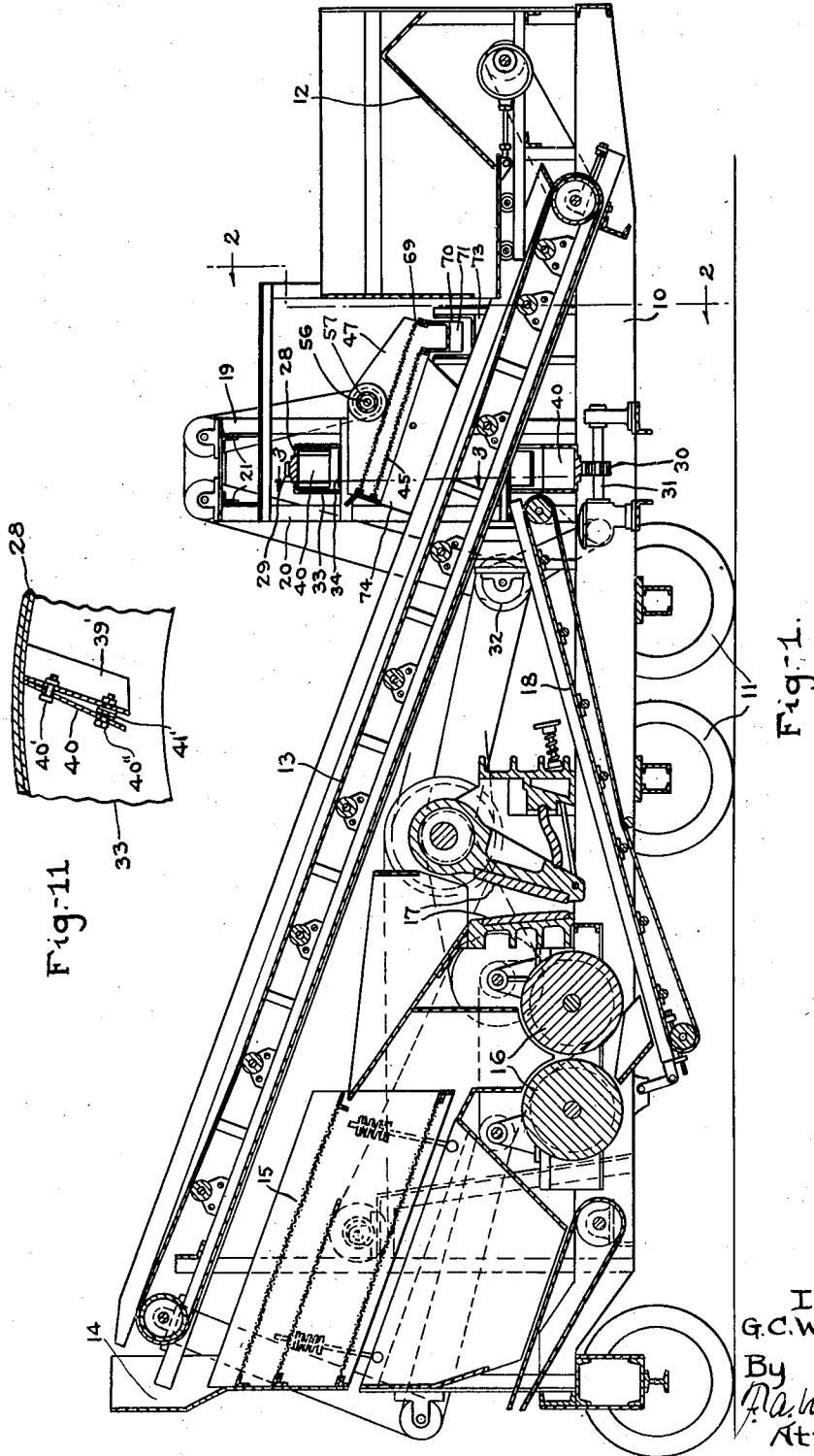
G. C. WINTHER

2,256,731

MEANS FOR FORMING AND SEGREGATING ROCK CHIPS FROM AGGREGATES

Filed July 10, 1939

3 Sheets-Sheet 1



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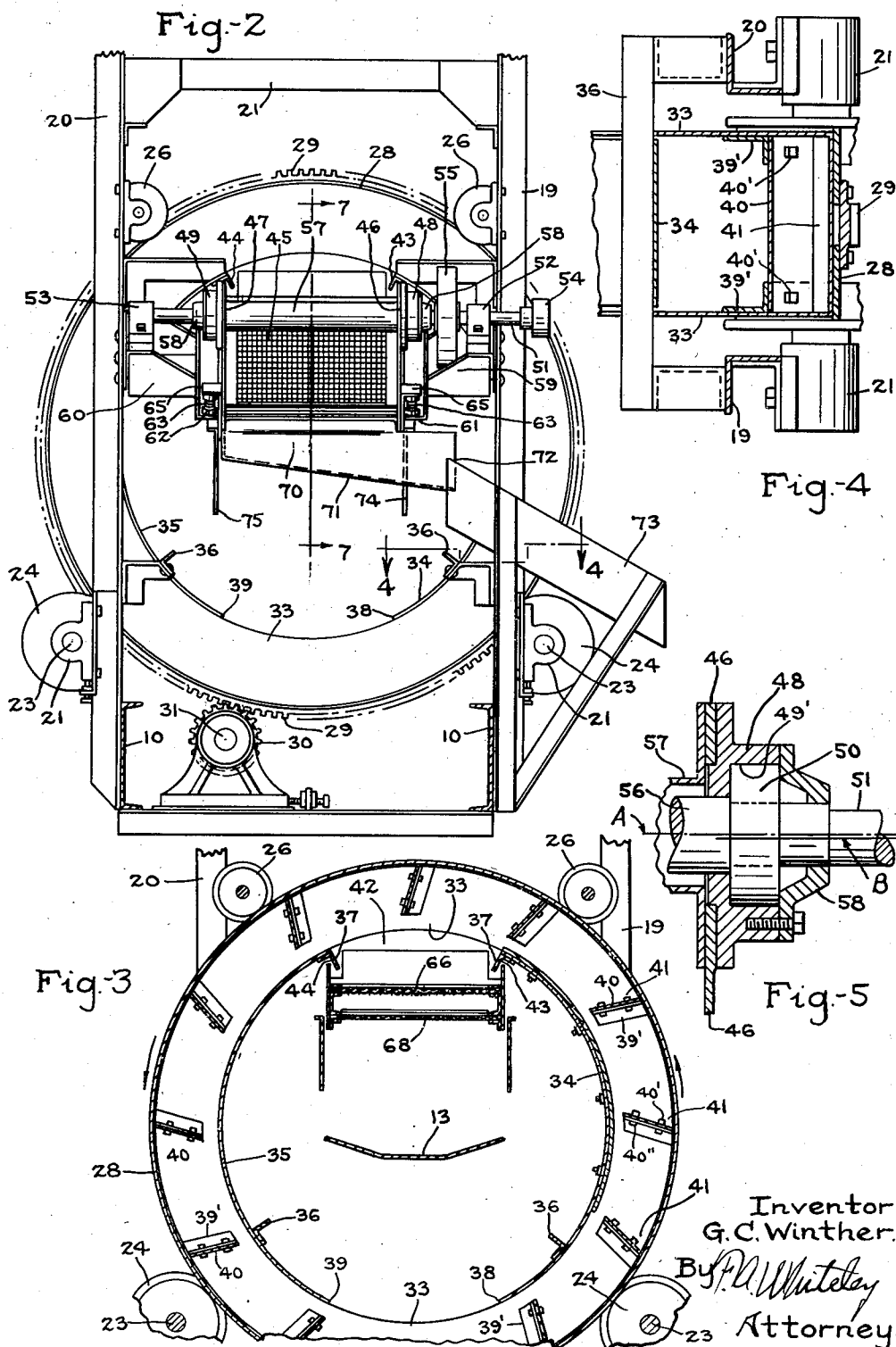
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Fig-6.

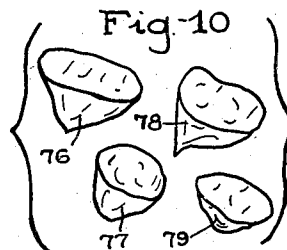
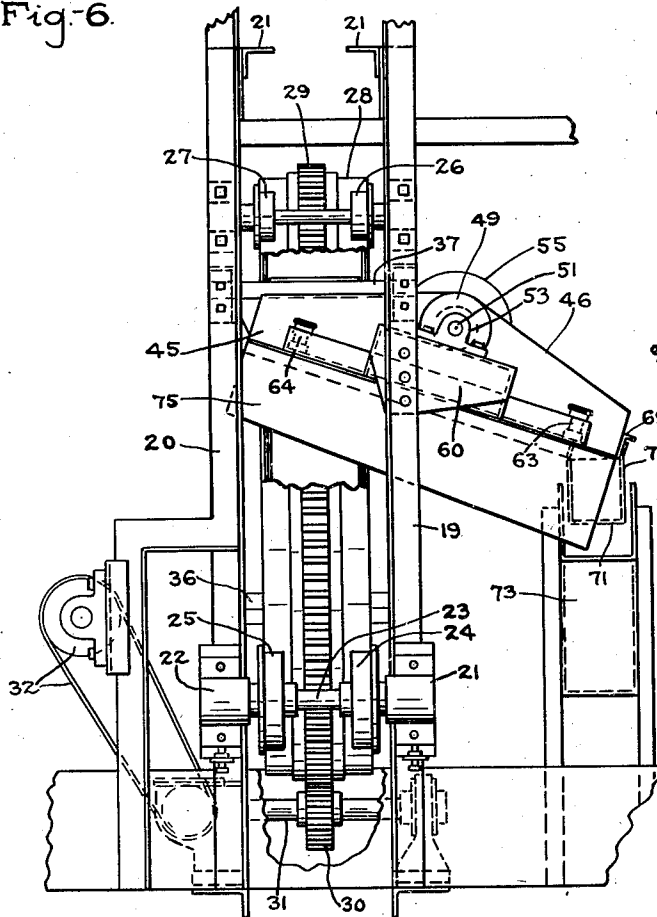


Fig-8

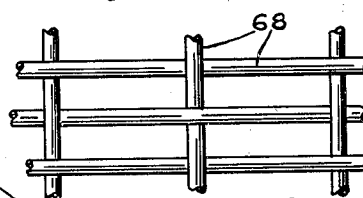
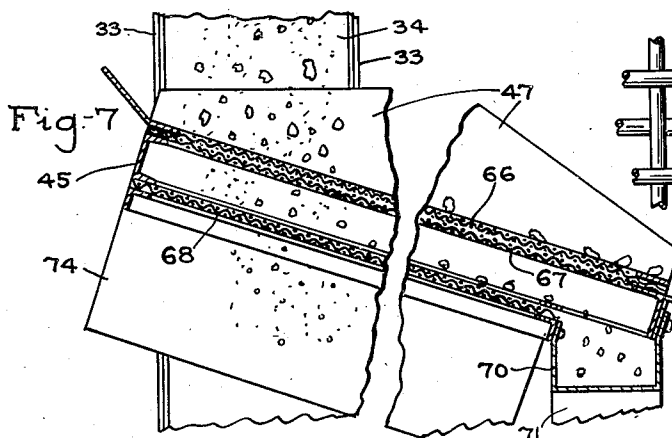
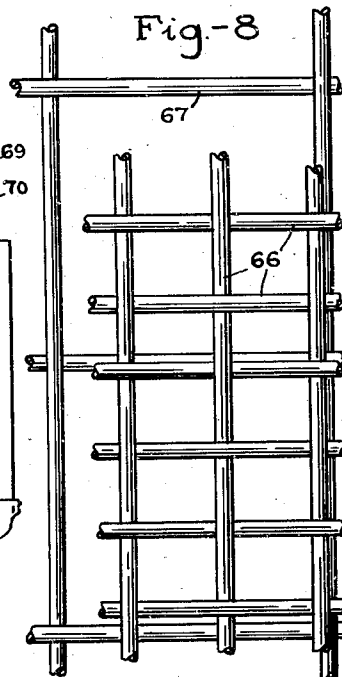


Fig-9

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UNITED STATES PATENT OFFICE

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MEANS FOR FORMING AND SEGREGATING
ROCK CHIPS FROM AGGREGATESGeorge C. Winther, Minneapolis, Minn., assignor
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7 Claims. (Cl. 83-93)

My invention relates to means for forming and segregating rock chips from aggregates and has for its principal object to treat materials such as gravels containing a large percentage of rocks, boulders, pebbles and the like, or broken rock with crushers, sifters and conveyors, whereby what are known as rock chips are produced and to separate from the mass being treated said rock chips.

Rock chips may be defined as small portions of rock having in general an angular shape with numerous faces of not large all-over area and with more or less sharp edges and points. In modern road construction, particularly where asphalt or oil binders are used, there are two fundamental advantages in the use of rock chips. The first of these advantages is in the filling of voids formed in a roadway by normal broken rock aggregates. Such rock aggregates, being quite large in individual pieces, assume positions wherein there are gaps or voids between and among these pieces. A thin layer of rock chips may be laid over such a surface and then rolled and will fill the voids and provide a comparatively solid base for the overlying asphalt or oil binder.

Another advantage is, in the use of rock chips with asphalt and oil binder roads, to provide a better traction surface on the road. In such roads it has been found that the road surface accumulates a film of oil from traffic moving over it and when it is wet by rain, it becomes dangerously slippery, so that skidding is difficult to avoid. Many such roads are now in existence throughout the country, and have produced a vast number of accidents from skidding on the wet surface. As a result, highway departments now make a practice of spraying the surface of the road with oil and immediately following with a layer of sand, the theory being that the oil will bind the sand to the surface of the road and sufficiently roughen it so that the tires of vehicles will hold the road. This, in practice, is not only expensive, but is not very effective, since the oil dries away, traffic tends to pick up and throw the sand particles, and heavy rain washes them off the road.

If however, the top surface of an asphalt or oil binder road can be made with what is known as rock chips, as above defined, it is found that the sharp angles of the rock chips push up at the surface so as to lift the surface and protrude slightly and in this way sufficiently roughen the road and provide anchored projections for tires to grip, and tend to free such roads from the

slippery condition which otherwise makes them dangerous to drive over when wet.

In the normal preparation of aggregates for road building from different types of rock bearing gravels or broken rock, a certain percentage of rock chips is formed. The difficulty has been to separate these rock chips from the mass of aggregate since there are not enough rock chips relatively in the whole mass of aggregate to perform the valuable functions above described, and these functions can only be realized by employing separated layers of the rock chips. There are no rock chips properly speaking, in gravels as they come from the pit from which by far the greater part of road building materials are derived. I have discovered however, that after the rock content of gravel has gone through the crushers, or after suitably broken rock has gone through the crushers, a percentage of angular-edged rock chips is formed. If however, these rock chips are returned directly to the main conveyor to be delivered thereby to the normal sifting mechanism, they will go through the sieves with other material, where they will not be available for the special use desired.

A chief object of my invention, therefore, is to provide means for separating the above described rock chips from the aggregate that has passed through the crushers before such aggregate has been delivered to the main conveyor which normally carries to the sieves the product of the crushers, and in conjunction with raw aggregate from the pit. In carrying out this object I have devised a means of receiving the aggregate as it comes from the crushers and delivering it to a specially constructed sifting means which simultaneously removes the rock chips developed in the crushers and passes the remainder of the aggregate to the main conveyor carrying the raw aggregate as it comes from the pit.

It is a further object of my invention to employ a vertical rotary lifting wheel which surrounds the main elevating conveyor and is located between the hopper for receiving the raw aggregate from the pit and the top hopper for delivering the mass of aggregate, from the crusher and from the pit co-mingled, to the principal sifting and sorting means.

It is a further object of my invention to provide a supplemental sifting means located directly above the main conveyor and between it and the inner circumference of the rotary lifting wheel so that the crusher aggregate is delivered to the supplemental sifting device whereby the

rock chips will be separated from the mass of aggregate coming from the crushers.

The full objects and advantages of my invention and the combinations for producing the advantageous and desirable results of the invention are particularly pointed out in the claims.

In the drawings indicating an application of my invention in one form:

Fig. 1 is a side elevation part sectional view of a portable aggregate making device embodying my invention.

Fig. 2 is a rear end elevation view partly in section with some elements omitted taken on line 2—2 of Fig. 1.

Fig. 3 is a sectional elevation view taken through the vertical carrier and the rock chip sieve mechanism taken on line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a fragmentary sectional view of the eccentric means for vibrating the chip separating sieves.

Fig. 6 is a side elevation view of what is shown in Fig. 2.

Fig. 7 is a vertical sectional view along the chip separating screens taken on line 7—7 of Fig. 2.

Figs. 8 and 9 are plan views showing character of the screens.

Fig. 10 illustrates in a general way the type of chips which it is designed to separate from the mass of aggregate.

As illustrated in the drawings, the frame 10, supporting wheels 11, inlet or receiving hopper 12, main conveyor 13, sieve hopper 14, sorting sieves 15, roller crushers 16, jaw crushers 17, and conveyor 18 underlying the crushers are or may be of well known construction. My invention relates to the means for handling and sorting the aggregate delivered to conveyor 18 from crushers 16 and 17.

A framing consists of front and rear sets of side posts 19 and 20 respectively secured at their bottoms to main frame pieces 10, Fig. 2, and which in turn may be suitably held together by ties such as 21 shown in Fig. 2. Mounted on these upright posts are sets of journals 21, 22, Figs. 2 and 6, in which are mounted shafts 23 on which are sets of supporting rollers 24 and 25 as clearly indicated in Figs. 2 and 6. Similarly mounted sets of guide rollers 26 and 27 are provided toward the top of respective sets of posts 19 and 20. Supported and held to rotate freely in a vertical plane by the sets of rollers 24, 25 and 26, 27, is a cylindrical wheel-like drum 28 which has surrounding it a gear 29 that meshes with a pinion 30 on a shaft 31 driven through belt and pulley organization 32 in a well-known way from power means not specifically shown.

As shown in Figs. 2, 3 and 4, the drum 28 is provided with annular side flanges 33 whose inner edges substantially meet the side edges of semi-cylindrical shields 34 and 35 supported by lower frame pieces 36 and upper frame pieces 37, as clearly shown in Figs. 2 and 3. There is thus a bottom space between edge 38 of shield 34 and edge 39 of shield 35 open to receive aggregate from the crushers delivered thereto by conveyor 18. The drum has secured to its side flanges 33 a series of angle iron members 39' which are positioned to support adjustable partition members 40, Figs. 3 and 11, extending between the side flanges 33 and tipped at a forwardly extending angle relative to the drum face 28. The

plates 40 are secured to the flange supports 39' by means of bolts 40' and 40'', the bolt 40' being threaded over a length sufficient to permit the insertion of washers 41' between plates 40 and angle iron supports 39' so as to have a desired range of adjustment of the angularity of plate 40 relative to drum 28. This adjustment has important advantages for the handling of certain kinds of crusher aggregates. This arrangement is such that pockets 41 of variable angularity are formed against the drum 28 and between side flanges 33 and over partition plates 40 so that aggregate fed by conveyor 18 through the opening between the bottom edges of shields 34 and 35 is received by these pockets and carried upwardly to be discharged through a top opening, indicated at 42, between the upper edges of shields 34 and 35. And the margins of opening 42 are extended inwardly by pieces 43 and 44 forming parts of the angle iron supports 37.

The result of this arrangement is that when the vertical lifting member 28 is rotated on its supporting rollers while conveyor 18 is delivering aggregate through bottom opening between edges 38 and 39 of shields 34 and 35 said aggregate will be lifted from the bottom of the vertical lifting drum 28 to the top thereof to be passed through the top opening 42. From there it falls upon a screen or sifting mechanism 45, which is shown in side elevation in Fig. 6, in end elevation in Fig. 2, and in longitudinal section in Fig. 7.

This sieve is mounted to vibrate within the inner circumference of the vertical lifting drum 28 and directly above and along the main conveyor 13, which, as shown in Fig. 1, passes through the central opening of the lifting drum 28. The sieve provides an upper hopper formed by upper side shields 46 and 47, with a sieve structure at the bottom of said hopper. The side shields 46 and 47 are secured to hub members 48 and 49, Figs. 2 and 5, which have within them a cylindrical seat 49' engaged by a cylindrical roller 50 on a shaft 51 which is supported in bearings 52, 53, Fig. 2, and driven from a pulley 54. The shaft 51 has thereon an inertia fly wheel 55 and is eccentric with respect to roller 50, as clearly shown by center lines A and B in Fig. 5. An enlarged continuation 56 of shaft 51 runs through a cylindrical housing 57 across the hopper formed by the side walls of shields 46 and 47. A cap 58 houses and seals in the rollers 50, Fig. 5.

The assemblage is supported by bracket arrangements 59 and 60 bolted to the frame members 19 on each side of the hopper construction. These brackets are provided with ledges 61 and 62, Fig. 2, on which are mounted front pairs of springs 63 and rear pairs of springs 64, Fig. 6. These springs are secured to or engage with supporting extensions 65 on the side members 46 and 47. In this manner the main weight of the screen assemblage 45 is supported upon the eccentric rollers 50 with the sets of spring members 63 and 64 holding the screen assemblage against excessive oscillation on the rollers 50. It follows that when the shaft 51 is rotated, rotating with it the eccentrically mounted rollers 50, the whole screen assemblage will be given a desired vibrating movement, which will cause particles of a size to pass the screens to go through, and, since the screens slope downwardly, Fig. 7, will cause material which does not pass the screens to be moved to the discharge ends thereof.

The screen itself is shown in Figs. 7, 8 and 9. The top screen comprises two contacting portions 66 and 67, of which the member 66 is the

real screen with a mesh which, for example, may have $\frac{1}{2}$ " x $\frac{3}{8}$ " openings, and the screen 67 is really only a support for screen 66, having a mesh with 2" square openings. The lower screen 68, Figs. 7 and 9, may be provided, for example, with 1" x $\frac{1}{4}$ " openings. This screen really is the skimmer. As clearly shown in Fig. 7, the top screen 66 permits finer material, including chips to be sorted, to pass through, while the larger pieces of rock pass off the screens at 69 to discharge directly upon the main conveyor belt 13, Fig. 3. The material which goes through all the screens, including screen 68, also discharges directly upon the main conveyor belt as it moves through the center of vertical lifting wheel 28. The chips separated from the aggregate pass through a discharge chute 70 having a sloping bottom 71 which is secured to the edge of the sieve assemblage 45, as clearly shown in Figs. 2 and 7. The mouth 72 of chute 70 overlies a sloping discharge chute 72 and vibrates within it, Figs. 2 and 6 whereby the sorted chips are delivered at the side of the machine. Side members 74 and 75 are carried by bracket assemblages 59 and 60, extend to a point close to the main elevating conveyor 13 to guide the material passing through upon the conveyor and prevent its scattering at the sides.

Fig. 10 illustrates the general type and shape of chips, as indicated by the several forms of chips 76, 77, 78 and 79, there shown. There is a comparatively small output of these chips, perhaps ten per cent of the usable aggregate, delivered by the machine. But this is sufficient for the use intended, as the rock chips are desired only for a thin layer at the top surface of the roadway.

The advantages of my invention have been quite fully given in connection with the detailed description thereof. The primary advantage is that, in a portable machine for preparing aggregates for road construction, the same machine is made available to produce a requisite amount of the highly desirable rock chips with no added expense to the operator. A further advantage comes from the fact that this is accomplished by reason of its association with a vertical lift device without any material increase in the overall length on the machine and with no increase at all in its height, factors of great importance in connection with a portable machine for obtaining road-making aggregates. A feature of the machine which aids in securing these important advantages is the mounting of the vertical lift-wheel about the main elevator between the hopper for delivering pit run of aggregate to the main elevator belt and the hopper for receiving the aggregate from that belt, and the mounting of the chip sorting mechanism within the limits of the lift-wheel and above the main conveyor belt.

I claim:

1. In a portable machine for forming aggregates, a main frame, a main conveyor supported by said frame and extending angularly from a lower to a higher position, a hopper for delivering aggregate to the lower end of said main frame, a second hopper for receiving aggregate from the upper end of said conveyor, a transverse lifting wheel located between the said hoppers and surrounding the main conveyor, a crusher adapted to receive aggregate from the upper hopper, means for moving crusher aggregate from said crusher to the transverse lifting wheel, a sifting assemblage having a portion located

within the circumferential limits of the lifting wheel and above the main conveyor for receiving the crusher aggregate from the lifting wheel, said sifting assemblage embodying means for separating rock and chips from the mass of aggregate and for returning the crusher aggregate not so separated to the main conveyor.

2. A machine for obtaining rock chips from aggregates that have passed a crusher comprising a main elevator, a lifting elevator wheel surrounding the main elevator, means for delivering aggregate from the crusher to the elevator wheel, and means interposed between the elevator wheel and the upper surface of the main elevator for separating the rock chips from the crusher aggregate going to the main elevator and for delivering said chips outside the machine.

3. A machine for obtaining rock chips from aggregates that have passed a crusher, comprising a main elevator, a vertical lifting elevator wheel surrounding the main elevator, means for delivering aggregate from the crusher to the elevator wheel, a sifting assemblage interposed between the elevator wheel and the upper surface of the main elevator and extending transversely of the elevator wheel and along the main elevator for receiving the crusher aggregate and separating and delivering outside the rock chips while permitting the aggregate not so separated to be returned to the main elevator.

4. A machine for obtaining rock chips from aggregates that have passed a crusher comprising a main elevator, a lifting elevator wheel surrounding the main elevator, means for delivering aggregate from the crusher to the elevator wheel, a sifting assemblage interposed between the elevator wheel and the upper surface of the main elevator and along the main elevator for receiving the crusher aggregate, and for separating and delivering outside the machine the rock chips while permitting the aggregate not so separated to be returned to the main elevator, and means supporting said sifting assemblage located adjacent but outside the limits of said lifting wheel so that a portion of the sifting assemblage extends across the transverse extent of the lifting wheel.

5. A machine for obtaining rock chips from aggregates that have passed a crusher comprising a main elevator, a lifting elevator wheel surrounding the main elevator, means for delivering aggregate from the crusher to the elevator wheel, a sifting assemblage interposed between the elevator wheel and the upper surface of the main elevator and along the main elevator for receiving the crusher aggregate and for separating and delivering outside the machine the rock chips while permitting the aggregate not so separated to be returned to the main elevator, and means supporting said sifting assemblage located adjacent but outside the limits of said lifting wheel so that a portion of the sifting assemblage extends across the transverse extent of the lifting wheel, said supporting means embodying means for vibrating the sifting assemblage.

6. In a portable machine for forming aggregates including a main conveyor, rock crushers and a second conveyor for taking aggregates from the crushers, a sifting device for receiving aggregate from the main conveyor and delivering the larger particles of said aggregate to the crushers, a second sifting device located above the main conveyor and above the end of the second conveyor, means for moving aggregates from

the second conveyor to and upon the second sifting device, and means associated with the second sifting device for separating rock chips from the body of aggregates, and to permit delivery of the remainder of the aggregates upon the main conveyor, and means operative to discharge the separated rock chips outside the machine.

7. In a portable machine for forming aggregates including rock crushers and a conveyor for taking aggregates from the crushers, a transverse lifting wheel to which said conveyor delivers, said transverse lifting wheel having a central opening free of obstruction, shields extending around the sides of the opening through said lifting wheel to close the inside of the same

except to leave top and bottom openings thereto, said first-named conveyor delivering to the lifting wheel through said bottom opening, a main conveyor extending through the lifting wheel between said top and bottom openings, a sifting device extending through said central opening above said main conveyor and receiving material from the lifting wheel through said top opening, and means associated with said sifting device for separating rock chips from the mass of aggregate delivered thereto and for permitting delivery of crusher aggregate not so separated to the main conveyor, and means for conveying rock chips outside of the machine.

GEORGE C. WINTHER.