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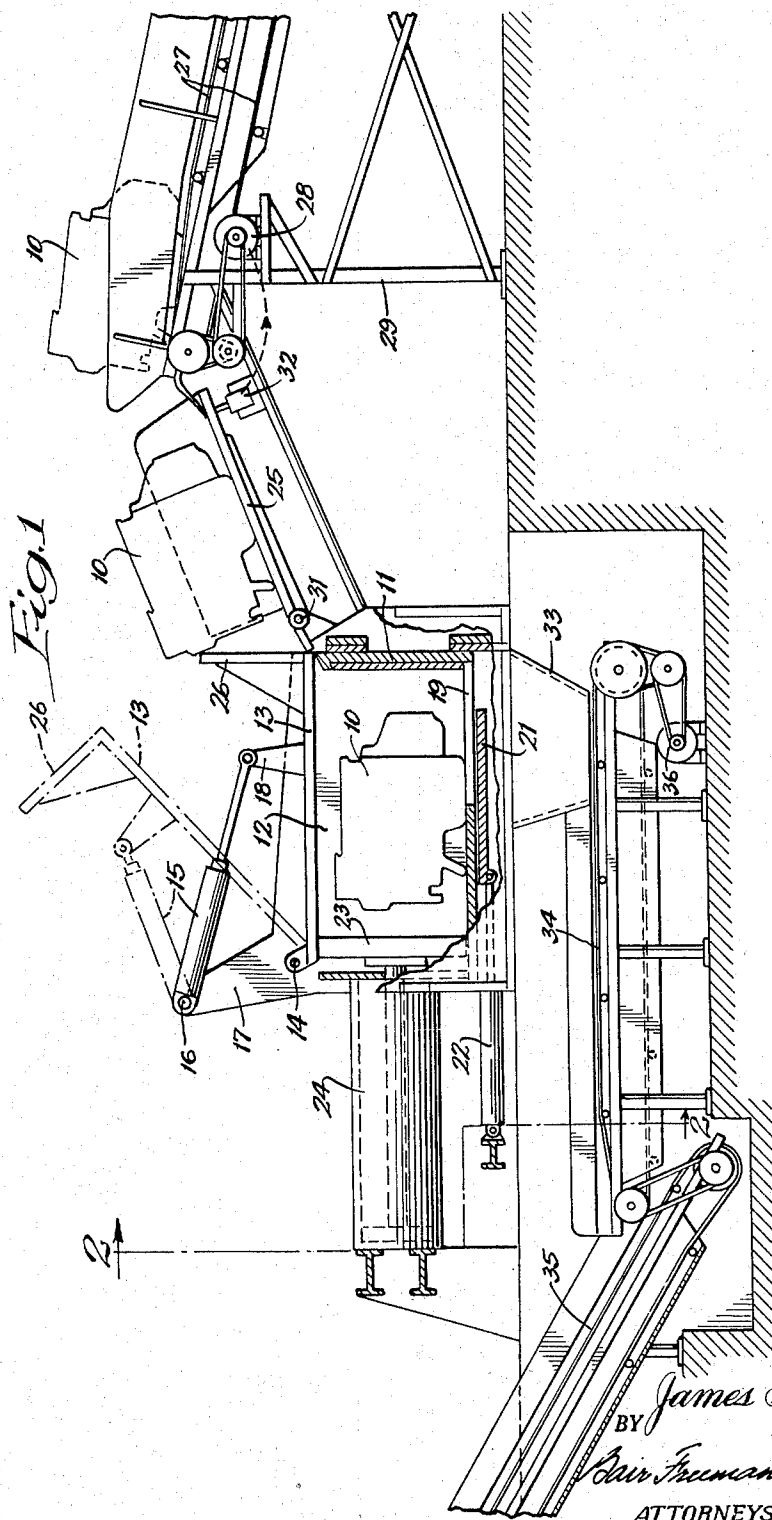
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2,907,530

CRUSHER FOR ENGINE BLOCKS AND THE LIKE

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2 Sheets-Sheet 1



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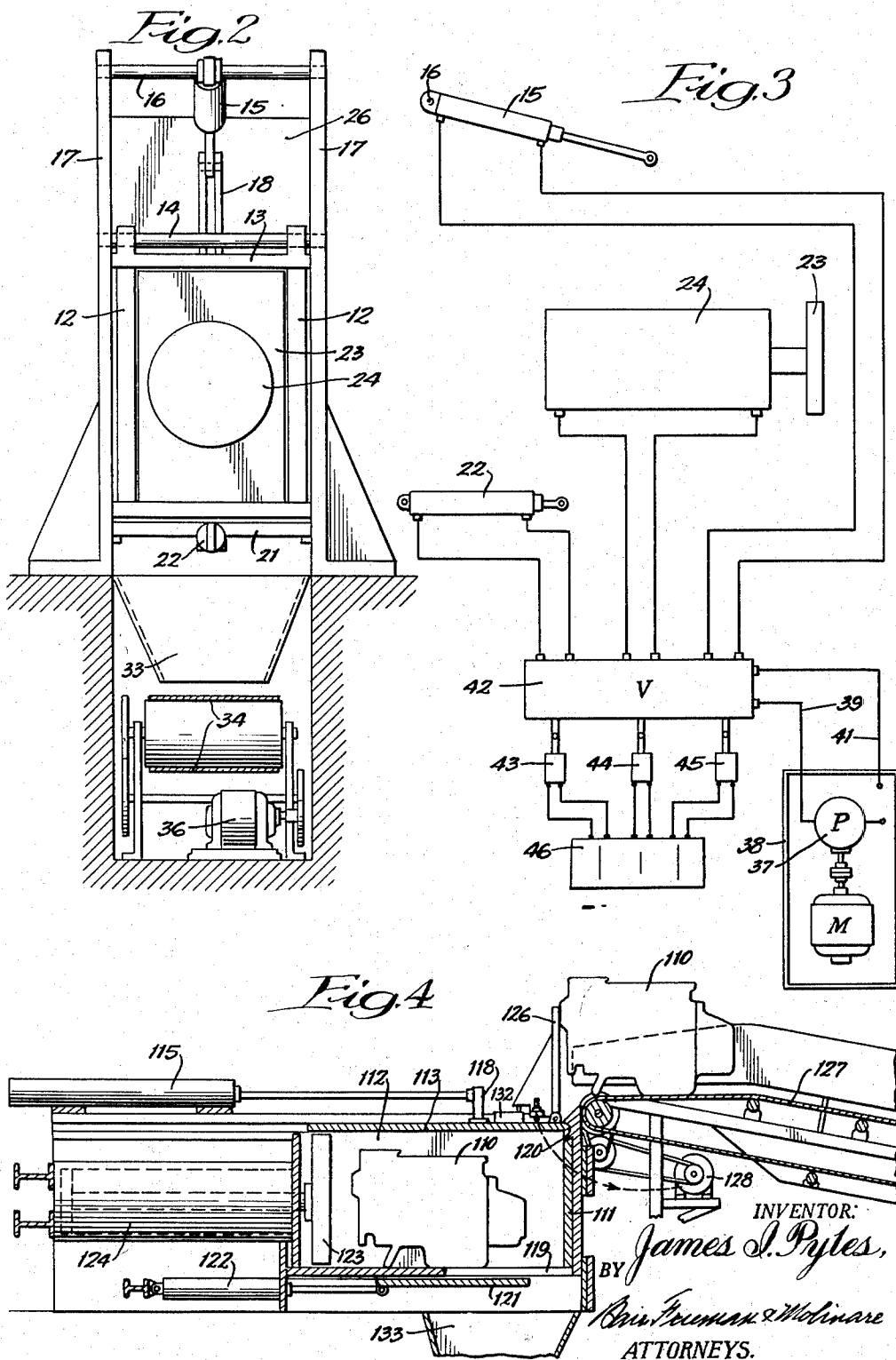
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CRUSHER FOR ENGINE BLOCKS AND THE LIKE

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This invention relates to crushers for engine blocks and the like and more particularly to an apparatus for breaking up or crushing devices formed of different types of materials to facilitate separation of the materials for scrap.

To obtain high grade metal scrap for use in foundries and the like, it is necessary to separate the different types of materials which may be used in a single assembly. For example, in engine blocks it is necessary to separate the cast iron parts from forgings, or high grade steel parts such as the crankshaft or camshaft from aluminum or other metals which may be used in pistons or other engine parts. Similarly, in transmissions it is necessary to separate the cast iron parts from the steel gears, shafts and the like.

Heretofore this has been accomplished by breaking up the assemblies through the use of drop hammers or the like or cutting them up by cutting torches. These operations are slow and laborious and require a great deal of hand labor.

It is accordingly one of the objects of the present invention to provide a crusher for engine blocks and the like by which the materials to be separated are crushed rapidly and effectively into relatively small pieces which are easily sorted.

Another object is to provide a crusher which operates automatically with a minimum time of an operator being required.

Still another object is to provide a crusher in which the materials are crushed by a power operated ram in a closed chamber and the crushed parts are discharged onto a sorting conveyor.

According to one feature of the invention, the material to be crushed is moved to the crushing chamber by a power operated conveyor, and control means are provided to stop the conveyor to prevent jamming of the material. In one form the material is received on a sloping support and slides by gravity from the support into the crushing chamber when a closure for the chamber is open and in another form the material is fed by the conveyor directly into the chamber.

A further object is to provide a crusher in which the closures and crushing ram are operated in an automatic cycle by an automatic controller.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawings, in which:

Figure 1 is a side elevation with parts in section of a crusher embodying the invention;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a diagram of the automatic control system; and

Figure 4 is a partial view similar to Figure 1 of an alternative construction.

The crusher of the present invention is adapted to crush materials such as engine blocks, transmissions, or other assemblies containing housings of cast iron or the

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like and internal parts formed of different materials which are to be separated from the cast iron in the preparation of high grade metal scrap. As shown, the crusher is adapted to crush engine blocks illustrated at 10 to separate the cast iron parts from other parts of the assembly which may be formed of different materials.

The crusher itself comprises a rectangular chamber having a fixed end wall 11 and fixed side walls 12 and with an open top through which the engine blocks or other material to be crushed may be fed in. The top is adapted to be closed during the crushing operation by a closure 13 pivoted on a horizontal axis 14 at one end of the chamber and swingable between a closed position as shown in full lines in Figure 1 and an open position shown in dotted lines. The closure may be swung between its open and closed positions by a fluid motor 15 pivoted at one end on a cross rod 16 carried by upwardly extending projections 17 at the sides of the chamber. At its other end, the fluid motor is pivotally connected to a bracket 18 projecting upwardly from the closure 13 near the free end thereof. When the fluid motor is expanded as shown in full lines in Figure 1, the closure will move down to its closed position and will be held tightly closed while, when the motor is contracted, it will be swung up to its open, dotted line position.

The bottom of the chamber is formed with a discharge opening 19 at one end thereof which may be closed by a slidable closure plate 21 supported in tracks at the bottom of the chamber to slide from an open to a closed position. The closure 21 is adapted to be slid by a fluid motor 22 secured near one end of the chamber and connected to the closure 21 to move it in one direction or the other as fluid is supplied to one end or the other of the motor 22.

The end of the chamber opposite to the fixed end 11 is formed by a slidable ram or plunger 23 which is preferably of substantially the same size and cross section as the chamber when it is closed and which is movable into the chamber toward the end 11. The ram or plunger 23 is moved by a fluid motor 24 mounted at one end of the chamber and directly connected to the plunger 23 as shown. It will be apparent that when the plunger 23 moves to the right in the chamber it will crush and break up any material in the chamber and that the crushed parts can then be discharged through the discharge opening 19.

To feed material to be crushed into the chamber, a sloping support 25 is provided adjacent to the closed end 11 of the chamber and sloping down toward the chamber so that material thereon will tend to slide by gravity into the chamber. To prevent material from sliding off of the support when the closure 13 is closed, a stop plate 26 is provided at the free end of the closure 13 and projects upwardly therefrom to engage material on the support 25 and to hold it against sliding therefrom. When the closure 13 is raised to its open position, the stop plate 26 will be moved away from material on the support which can then slide by gravity into the crushing chamber.

Material to be crushed is fed onto the support 25 by an endless belt type conveyor 27 driven by a source of power, such as an electric motor 28. The conveyor 27 is supported on a frame 29 to slope upward as shown and to discharge engine blocks or other material to be crushed directly onto the upper end of the support 25 in a position to be fed into the crushing chamber by gravity.

The conveyor 27 is controlled in response to the presence of material on the support, to be stopped when the support is loaded. For this purpose, the support 25 is pivoted at its lower end on a horizontal axis 31, and its upper end is controlled by a spring loaded switch 32. The switch 32 contains a spring which normally tends to elevate the free end of the support and a switch

which is connected in circuit with the motor 28 so that when the support is elevated by the spring the motor will be energized, and when the support is swung down in response to a load thereon the motor circuit will be interrupted and the conveyor will stop. In this way, whenever the support 25 is empty, the conveyor will run to supply an engine block or other material to be crushed to the support, and whenever the support is loaded the conveyor will be stopped to prevent the possibility of jamming the apparatus.

Crushed material from the chamber is discharged from the discharge opening 19 through a discharge chute 33 onto a sorting conveyor 34 which in turn feeds a conveyor 35 to carry the sorted material to the desired point of use. The conveyors 34 and 35 may be separately driven by power means, such as an electric motor 36 whose speed is regulated to provide adequate sorting time for the crushed parts and to carry the parts away from the crushing chamber.

In operation, with the conveyor 27 loaded and with the closures 13 and 21 closed and the ram 23 retracted to the left as shown, engine blocks or the like to be crushed will be fed singly from the conveyor onto the support 25. As soon as the support is loaded, the conveyor will be stopped until the support is again unloaded.

At this time the apparatus is in a condition to start a crushing operation, and the control system for the apparatus as shown diagrammatically in Figure 3 may be energized to start the operation. This control system comprises a source of fluid under pressure for operation of the several fluid motors, which is illustrated as a pump 37, to pump liquid or the like from a tank 38 into a pressure line 39. Return fluid from the motors returns to the tank through a return line 41. The pressure and return lines 39, 41, are connected to a three-part multiple valve 42 whose three sections are separately controlled by solenoids 43, 44 and 45. The solenoids may be selectively energized by a conventional cycle control switch 46 to effect the desired sequence of operations in a manner well understood in the art.

When the control system is energized by starting the cycle switch 46 with the apparatus in the condition described above, the solenoid 45 will first be energized to open the pressure line 39 to the right side of the fluid motor 15 and the return line 41 to the left side of the motor so that the closure 13 will be raised to its open position. At this time, an engine block on the support 25 will slide by gravity into the crushing chamber and after a proper time interval the solenoid 45 will be de-energized to connect the left side of the fluid motor 15 to the pressure line and the right side to the return line so that the closure 13 will be closed. The cycle is so timed that the closure 13 will reach its closed position before the next engine block on the conveyor 27 is fed onto the support so that movement of the engine block off of the support will be prevented by the stop plate 26 and the weight of the engine block on the support will stop the conveyor.

With an engine block or the like in the chamber, the solenoid 44 will be energized to connect the left end of the cylinder 24 to the pressure line and the right end to the return line so that the plunger 23 will be advanced into the chamber to crush the material therein. The cylinder 24 is preferably adjusted to move the plunger 23 to a position spaced slightly from the fixed end 11 of the chamber, for example, in the case of engine blocks, to a distance of about 12". The fluid motor 24 may be made of sufficient size and subjected to sufficient pressure to apply the necessary crushing force to crush and break up the material in the chamber into relatively small parts. For example, in crushing engine blocks, a force of approximately 350 to 400 tons pressure may be applied which will break up the engine blocks and separate them into their various parts. In

this operation the cast iron block itself will be cracked and broken into relatively small pieces, the crankshaft, camshaft and pistons will come away from the block, and any gears or other similar parts in the assembly will fall away from the block. In crushing other parts, such as transmissions, a similar operation will be performed to break up the assembly into relatively small pieces which can easily be separated.

After the plunger 23 has advanced to crush the material in the chamber, the solenoid 44 is de-energized to reverse the connections to the cylinder 24 and to retract the plunger 23 to the left end of the crushing chamber. At this time, the solenoid 43 is energized to connect the right end of the cylinder 22 to the pressure line 39 and the left end to the return line so that the closure 21 will be slid to the left to open the discharge opening 19. At this time, the crushed parts will fall onto the sorting conveyor 34 where they may be sorted into the various materials involved very quickly and easily. After a sufficient interval to allow discharge of the crushed parts, the solenoid 43 will be de-energized to reverse the connections to the cylinder 22 and close the closure 21, at which time the cycle will be repeated.

Figure 4 illustrates an alternative construction in which the sloping support of Figure 1 is omitted and the conveyor feeds the material to be crushed directly into the crushing chamber. In this figure parts corresponding to like parts in Figures 1 to 3 have been indicated by the same reference numerals plus 100.

The top closure 113 for the crushing chamber 111 is in this construction made slidable horizontally toward the fixed end of the chamber to close the top of the chamber and away from the fixed end of the chamber to open it for reception of an engine block or the like to be crushed. The fluid motor 115 for operating the closure is mounted horizontally above the motor cylinder 124 for operating the ram 123 and is connected to a fixed bracket 118 on the closure. The closure 113 is slidable in guideways or the like at the sides of the chamber and is preferably tapered at its front end to fit into a tapered notch 120 in the fixed end of the chamber to secure the top closure tightly in place.

To feed the engine blocks or other material to be crushed into the chamber the conveyor 127 is extended to a point substantially registering with the top of the fixed end wall of the chamber to discharge the engine blocks over the fixed end wall and into the chamber when the closure is open. Engine blocks or other material fed by the conveyor will engage a stop plate 126 which is pivoted on the free end of the closure 113 and projects substantially vertically therefrom. The stop plate 126 controls a switch 132 for the motor 128 which drives the conveyor so that when the plate 126 is swung to the left it will open the switch 132 and stop the motor. When there is no pressure against the plate 126, the switch 132 will be closed by a spring or the like to restart the motor 128. The operation of this construction is substantially similar to that of the construction of Figures 1 to 3 and may follow the identical cycle controlled in the same way. With the closure 113 in its closed position, as shown, when a motor block or other material to be crushed is advanced by the conveyor 127 into engagement with the stop plate 126, the stop plate will be swung about its axis to open the switch 132 and stop the conveyor so that jamming of the material or damage to any of the parts of the apparatus will be prevented. After material in the chamber has been crushed and discharged through the discharge opening 119 and the closure 113 is moved to its open position by the cycle controller, the stop plate 126 will move away from the motor block on the conveyor allowing the switch 132 to close. At this time, the conveyor will start again to feed the endmost motor block into the crushing chamber and the crusher 113 will then be closed in the normal cyclic operation. When the first motor block stops the stop plate 126 the

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conveyor will again be stopped so that the motor blocks or other material are crushed sequentially in automatic cycle in the same manner as described above in connection with Figures 1 to 3.

It will be seen that to operate the apparatus of the present invention once the cycle is started it is necessary only to maintain engine blocks or other material to be crushed on the conveyor and to sort the crushed parts after discharge from the crushing chamber with the crushing operation itself automatically repeating in a cycle. Very little labor or supervision is therefore required in the operation of the apparatus, and the material to be crushed is broken up quickly and effectively for easy sorting in the preparation of high grade metal scrap.

While two embodiments of the invention have been shown and described in detail, it will be understood that these are for the purpose of illustration only and are not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A crusher for engine blocks and the like comprising a horizontally elongated chamber having a solid closure at one end, an open top and a discharge opening in its bottom, a movable closure for the open top of the chamber, a movable closure for the discharge opening movable away from the opening to allow crushed material to fall therethrough, a crushing ram movable horizontally in the chamber from its other end toward and away from said solid closure to crush material in the chamber, a fluid motor to move the ram to exert a predetermined crushing pressure between the ram and the solid closure, means to move the closures to open and closed positions so that material to be crushed can be loaded into the chamber through its open top when the top closure is open and the discharge opening closure is closed and so that crushed material can be discharged from the chamber when the discharge opening is open.

2. The crusher of claim 1 including a sloping support adjacent to the top of the chamber to feed material to be crushed into the chamber by gravity, and an upwardly projecting stop on the top closure to prevent movement of material from the support except when the top closure is open.

3. The crusher of claim 1 including a support adjacent to the top of the chamber to feed material to be crushed into the chamber by gravity, an upwardly projecting stop on the top closure to prevent movement of material from the support except when the top closure is open, a power driven conveyor to move material to be crushed onto the support, and control means responsive to the presence of material on the support to stop the conveyor.

4. The crusher of claim 1 including a sloping support adjacent to the top of the chamber to feed material to be crushed into the chamber by gravity, an upwardly projecting stop on the top closure to prevent movement of material from the support except when the top closure is open, means mounting the support for vertical movement in response to the weight of material thereon, a power driven conveyor to move material onto the support, and control means operable by vertical movement of the support in response to a load thereon to stop the conveyor.

5. The crusher of claim 1 including a support for material to be crushed sloping downward toward the other end of the chamber top to discharge material into the chamber by gravity, an upwardly projecting stop on the free end of the top closure to prevent discharge of material from the support into the chamber except when the top closure is open, a power driven conveyor to move material to be crushed onto the support, and control means responsive to the presence of material on the support to stop the conveyor.

6. A crusher for engine blocks and the like comprising

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a hollow chamber having an open top and a discharge opening in its bottom, a movable closure for the top, a movable closure for the discharge opening movable away from the opening to allow crushed material to fall there-through, a crushing ram movable into one end of the chamber to crush material in the chamber, means to feed material to be crushed into the top of the chamber when the top closure is in open position, power means to move the closures and the ram, the power means for moving the ram comprising a fluid motor to exert a predetermined crushing pressure on the ram and control means for the power means operable in a cycle to close the top closure, advance the ram to crush material in the chamber, retract the ram and open the closure for the discharge opening.

7. A crusher for engine blocks and the like comprising a hollow chamber having an open top and a discharge opening in its bottom, a movable closure for the top, a movable closure for the discharge opening, a crushing ram movable into one end of the chamber to crush material in the chamber, feeding means including a power driven conveyor to feed material to be crushed into the open top of the chamber, a stop on the closure for the top opening to prevent movement of material into the chamber when the closure is closed, control means for the power driven conveyor operated by the presence of material on the feeding means in engagement with the stop to stop the conveyor, and means to move the closures and the ram.

8. A crusher for engine blocks and the like comprising a hollow chamber having an open top and a discharge opening in its bottom, a movable closure for the top, a movable closure for the discharge opening, a crushing ram movable into one end of the chamber to crush material in the chamber, a power driven conveyor to feed material to be crushed directly into the open top of the chamber, a stop movably mounted on the top closure to be engaged and moved by material on the conveyor when the closure is closed, control means for the conveyor to stop it when the stop is engaged and moved by the material on the conveyor, and means to move the closures and the ram.

9. A crusher for engine blocks and the like comprising a hollow chamber having an open top and a discharge opening in its bottom, a movable closure for the top, a movable closure for the discharge opening, a crushing ram movable into one end of the chamber to crush material in the chamber, feeding means including a power driven conveyor to feed material to be crushed into the open top of the chamber, an upwardly projecting stop on the top closure to prevent movement of material from the feeding means into the chamber when the top is closed, control means responsive to the presence of material on the feeding means in engagement with the stop to stop the conveyor, power means to move the closures and the ram, control means for the power means operable in a cycle to close the top closure, advance the ram into the chamber, retract the ram, open the closure for the discharge opening, close the closure for the discharge opening and open the top closure, and a sorting conveyor beneath the discharge opening to receive crushed material from the discharge opening.

References Cited in the file of this patent

UNITED STATES PATENTS

140,019	Dixon et al. -----	June 17, 1873
233,192	Bean -----	Oct. 12, 1880
1,097,105	McGregor -----	May 19, 1914
1,703,127	Vial et al. -----	Feb. 26, 1929
1,812,797	Lindemann -----	June 30, 1931

FOREIGN PATENTS

488,558	Germany -----	Jan. 8, 1930
830,062	Germany -----	Jan. 31, 1952