Jan. 23, 1940. H. H. NICHOLSON 2,188,230

CRUSHER

Filed May 26, 1937 3 Sheets-Sheet 1

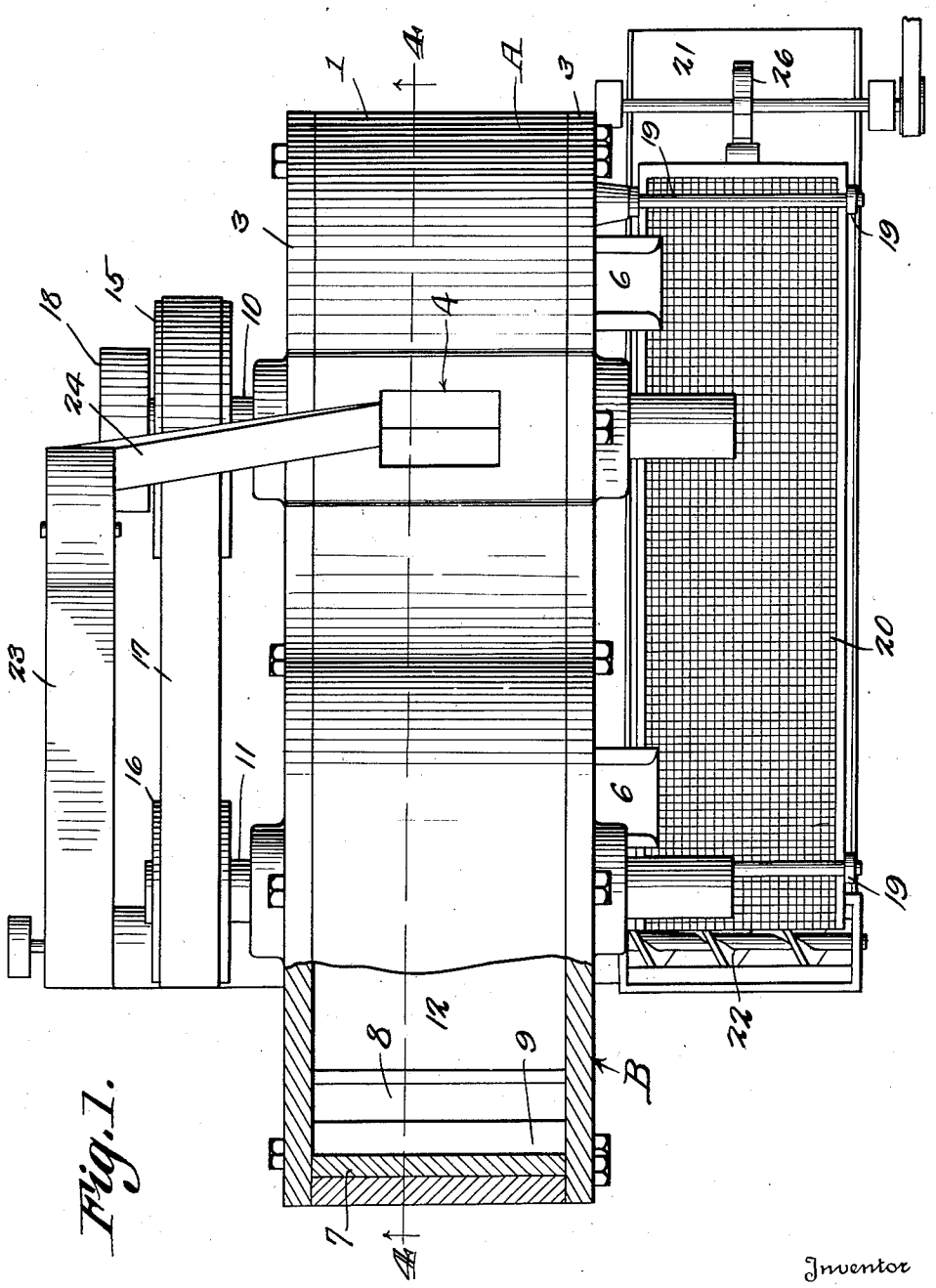


Fig. 1.

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Filed May 26, 1937 3 Sheets-Sheet 2

Fig. 2.

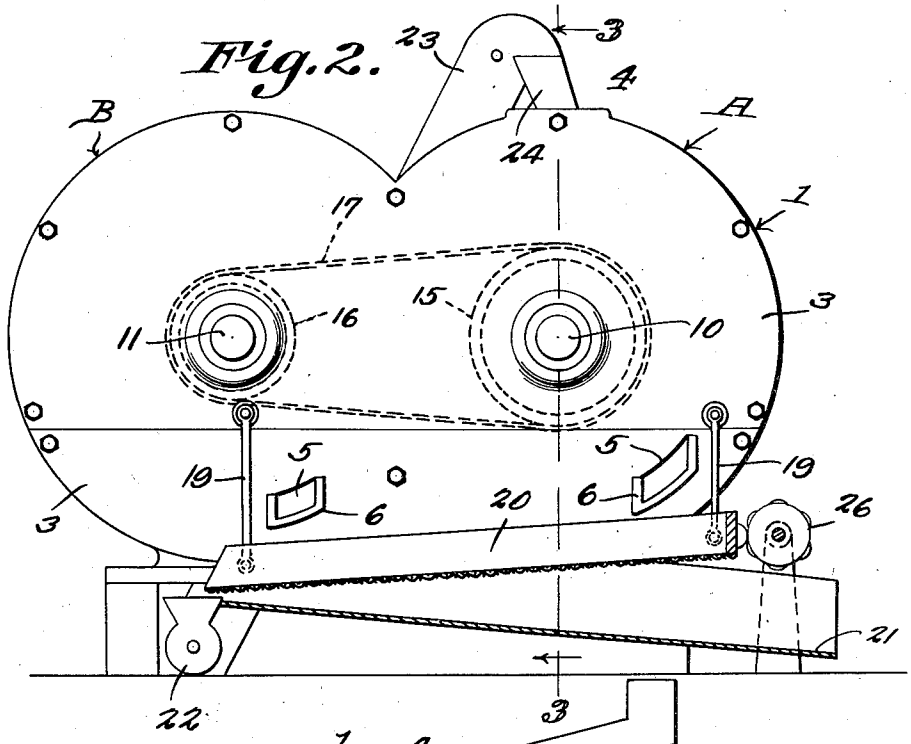
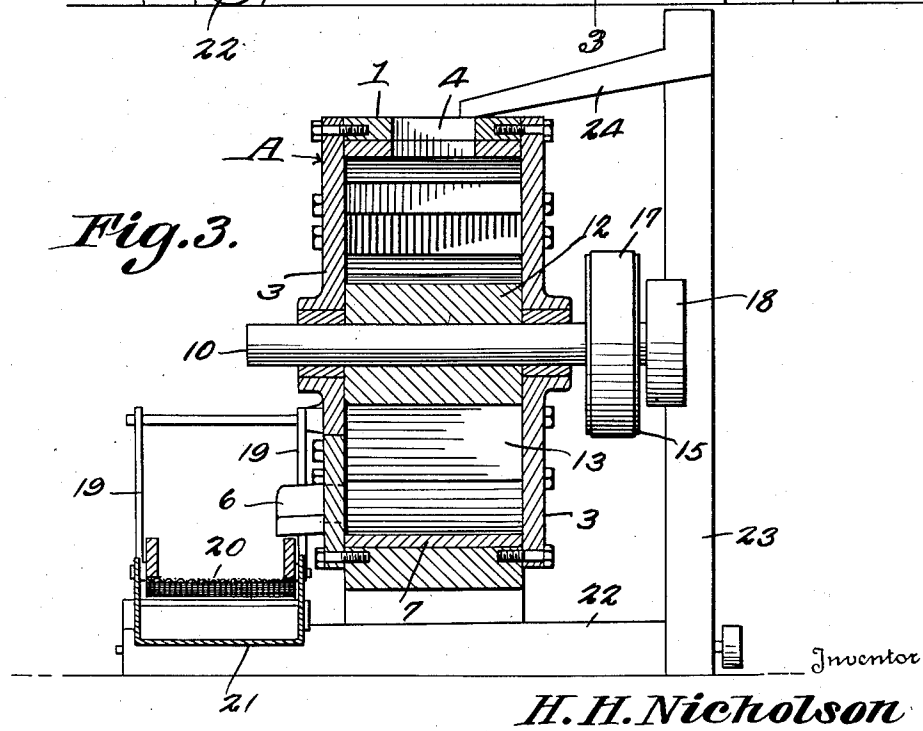


Fig. 3.



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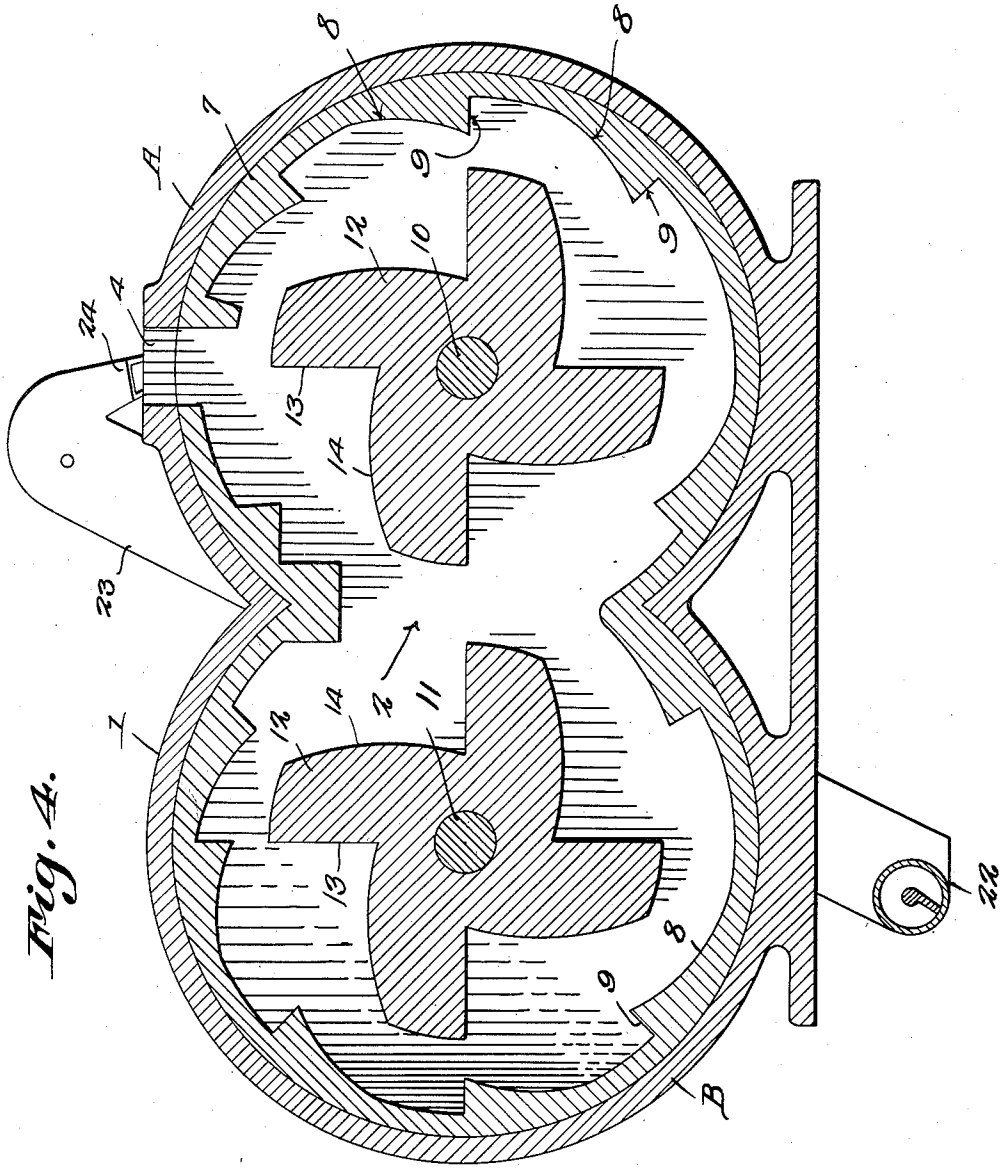


Fig. 4.

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UNITED STATES PATENT OFFICE

2,188,230

CRUSHER

Henry Harrison Nicholson, Boulder, Colo.

Application May 26, 1937, Serial No. 144,944

2 Claims. (Cl. 83—11)

This invention relates to machines for crushing ores and other solids and is especially useful for the purpose of reducing ores to a finely comminuted state whereby the values can be removed therefrom subsequently by suitable steps.

An object of the invention is to provide a machine of this character which is simple and compact in construction and will quickly reduce to a finely divided state, the material supplied thereto, the mechanism being such as to repeatedly act upon the material until it is properly reduced.

A still further object is to effect the reduction of the material in a closed area so that dust is eliminated.

A still further object is to provide a crusher which can be operated with less power than ordinarily, the principal drag on the power that is set up being that caused by the impact of the material with the crushing elements.

Another object is to provide a machine of this character which can properly reduce the material whether it be wet or dry.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings

Figure 1 is a plan view of the complete machine, a portion being broken away.

Figure 2 is a front elevation, the screen being shown in section.

Figure 3 is a section on line 3—3, Figure 2, the elevator chute being shown in elevation.

Figure 4 is a section on line 4—4, Figure 1.

Referring to the figures by characters of reference 1 designates the casing of the machine made up preferably of integral portions each of which extends through approximately 270° to a throat 2 through which the interiors of the sections communicate. Heads 3 are bolted or otherwise fastened to the casing so as to constitute closures for the fronts and backs thereof.

The sections of the casing have been indicated at A and B respectively, the section A being provided with an inlet opening 4 at the top thereof while both of the sections are provided adjacent to their bottoms and in one of the heads 3 with outlet openings 5 from which short spouts 6 extend.

Casing 1 is provided with a lining 7 which fits snugly to the inner surfaces thereof and is formed of a material of suitable hardness to resist wear due to the impact thereagainst of the material being reduced. The inner surface of this lining is formed with concave faces 8 each leading from the inner or edge portion of a shoulder 9 to the opposite or base portion of another shoulder. These shoulders are spaced apart different distances, said distances increasing in proportion to the distance of the shoulders from the upper wall of the throat 2.

Shafts 10 and 11 are journalled in the head 3 and secured to these shafts and within the casing 1 are rotary impellers 12 each provided preferably with four outstanding wings or blades of sufficient weight and thickness to withstand the strains resulting from violent contact with the materials being comminuted. The advancing face of each blade is preferably flat, as shown at 13, and disposed radially to the axis of rotation. The back face of each blade is preferably slightly convex, as shown at 14 and extends from the outer end of the advancing blade to the base of the next succeeding blade. These blades are all spaced desired distances from the shoulders 9, the distance depending upon the nature of the material to be comminuted. They also extend close to the throat 2 although ample space is left between the paths of the two sets of rotary impellers to permit material to pass freely between them at the throat.

Pulleys 15 and 16 are secured to shafts 10 and 11 respectively and are of different sizes, the pulley 15 being of greater diameter than the pulley 16. A belt 17 serves to transmit motion from one pulley to the other. A suitably located drive pulley 18 can be employed for receiving motion from any suitable source.

Hangers 19 are supported for oscillation in front of the casing 1 and carry a screen 20 which extends under the discharge spouts 6. This screen is located above a chute 21 which is inclined so as to carry away screenings. Tailings are delivered from screen 20 to a conveyer indicated generally at 22 which is extended transversely under the casing 1 to an elevator 23 which, in turn, is adapted to deliver material into a chute 24 discharging into opening 4.

Screen 20 is adapted to be vibrated in any suitable manner. For example a rotary tappet 26 can be located where it will strike against

one end of the screen when driven by any suitable means provided for that purpose.

In practice the rotary impellers are set in motion, it being designed to drive them at high speeds, the impeller on shaft 11 being driven at a greater speed than the other one although both impellers rotate in the same direction. The broken ore or other material to be treated is fed through the inlet opening 4 and will fall into the path of the rotating impeller thereunder with the result that this material will be thrown forcibly against some of the shoulders 9, will rebound against the impeller, and then be again forcibly projected against one or more other shoulders. This back and forth tossing of the material at high speed will continue as long as necessary, it being understood that the material will also be thrown back and forth between the impellers and thence around between both impellers and the series of shoulders adjacent thereto. This violent back and forth actuation will quickly reduce the material to such a condition that it can flow out through the opening 5 and onto the screen 20. As the screen is constantly agitated, the smaller particles will fall therethrough onto the chute 21 while the larger particles which are not of the proper degree of fineness, will pass off as tailings into the conveyer 22 and thus be carried to elevator 23 which, in turn, will return the same by way of chute 24 to the opening 4. Thus the material will again be acted upon as before after which the operation already described will be repeated.

The entire apparatus is so compact that it can be completely enclosed within a housing so as to prevent dust from spreading through the surrounding atmosphere. Furthermore the dust rising from the agitation of the material while being broken up within casing 1 will be practically confined entirely to the interior of the casing the only openings in which are the inlet 4 and the outlet 5.

It has been found in practice that an apparatus such as herein described requires much less power to operate than other devices of similar capacity and effectiveness, this being due to the fact that there is little drag upon the power set up other than that resulting from the rebound of the material from the shoulders 9 and against the advancing blades of the impellers 12.

It has also been found important to drive the two impellers at different speeds because this breaks up any tendency of rythmic action of the material within the apparatus and, instead, maintains the material in a high state of agitation while being broken up.

What is claimed is:

1. A device of the class described including a casing having opposed sections communicating through a throat therebetween, a lining within the casing having inwardly extending radial shoulders, impellers mounted for rotation within the respective sections and in the same direction, the shoulders in one of the sections being spaced apart distances increasing in proportion to their distance from the top of the throat and in the direction of rotation of the impeller in said section and the shoulders in the second section being spaced apart distances increasing in proportion to their distance from the top of the throat in a direction opposite to the direction of rotation of the impeller in said second section, and means connecting the impellers for driving them to throw material under treatment against the shoulders and to receive the impact of said material when rebounding from the shoulders, said impellers operating at different speeds simultaneously, means for screening material delivered from the sections, and means for returning tailings to one of the sections.

2. A device of the class described including a substantially imperforate casing having opposed sections communicating through a throat therebetween, impellers mounted for rotation in the respective sections and in the same direction, each impeller being substantially coextensive with the length of the casing axially of the impeller, inwardly extending radial shoulders in and extending from side to side of the sections, the shoulders in one of the sections being spaced apart distances increasing in proportion to their distance from the top of the throat and in the direction of rotation of the impeller in said section and the shoulders in the second section being spaced apart distances increasing in proportion to their distance from the top of the throat in a direction opposite to the direction of rotation of the impeller in said section, the casing being provided between the shoulders of the two sections, with concave surfaces coextensive in length with the length of the shoulders and means connecting the impellers for driving them to throw material under treatment against the shoulders and to receive the impact of said material when rebounding from the shoulders, said impellers operating at different speeds simultaneously, means for screening material delivered from the sections, and means for returning tailings to one of the sections.

HENRY HARRISON NICHOLSON.