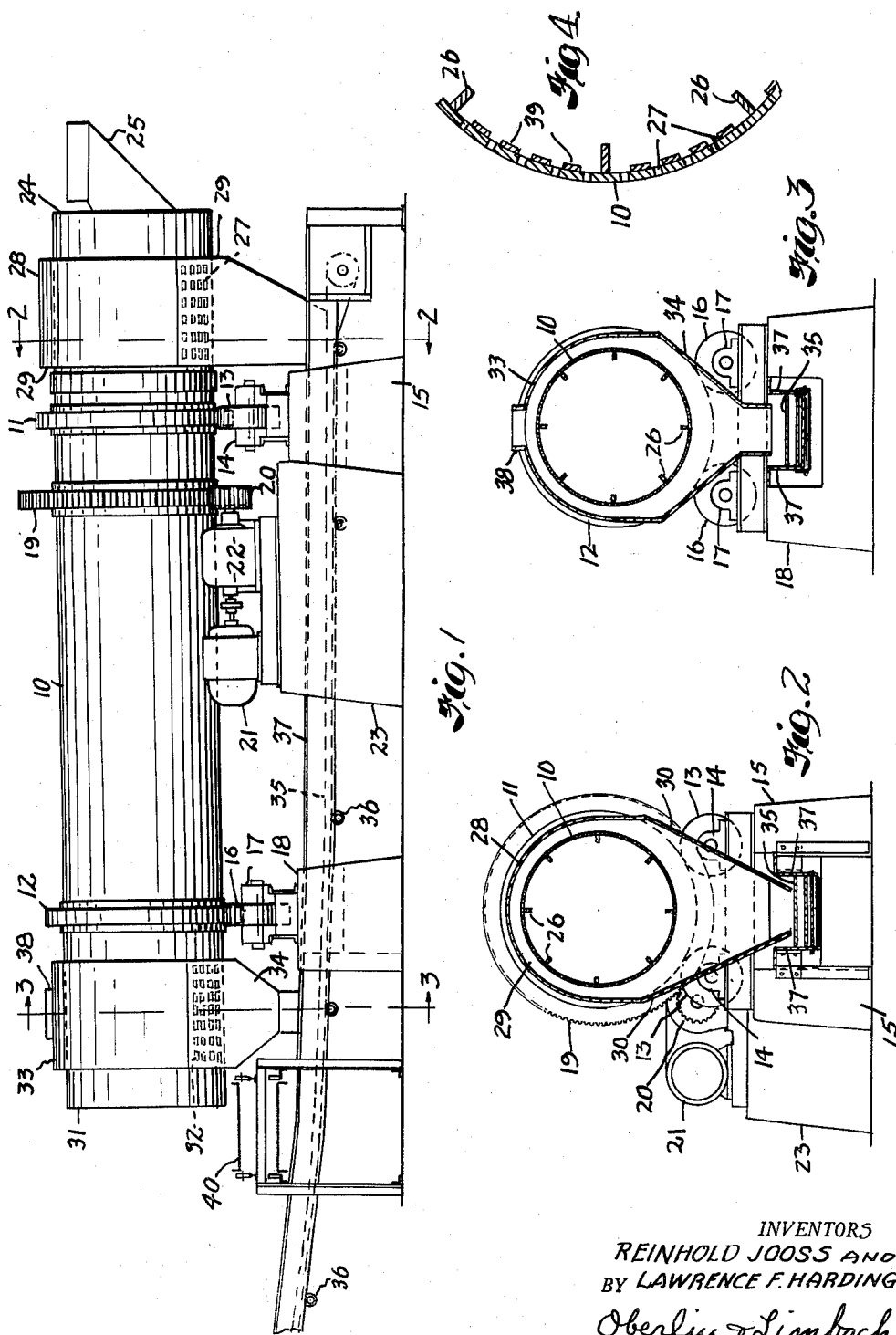


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R. JOOSS ET AL
SPRUE CLEANING MILL

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INVENTORS
REINHOLD JOOSS AND
BY LAWRENCE F. HARDING.
Oberlin & Limbach
ATTORNEYS.

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SPRUE CLEANING MILL

Reinhold Jooss, Cleveland, Ohio, and Lawrence F. Harding, Detroit, Mich., assignors to The C. O. Bartlett & Snow Company, Cleveland, Ohio, a corporation of Ohio

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1 Claim. (Cl. 15—90)

This invention relates to a special form of tumbling mill, known as a sprue mill, for cleaning gates, risers, fins and other sprue before charging the same into a cupola to recover the metal therein. As is well known, the sprues and the like often are heavily encrusted with mold sand, the presence of which is obviously objectionable in the cupola, and the function of the sprue mill is to separate such sand from the metal in a continuous process.

Briefly, the mill comprises a hollow cylinder preferably supported at an inclination to the horizontal and rotated on its axis. The material is fed into such cylinder at the elevated end of the same and in passing to the lower discharge end it is tumbled to remove sand encrustation from the metal pieces and also to break up any large core lumps which might have been included in the feed. The cleaned metal passes out through the lower end of the cylinder, while the sand grains are discharged through perforations in the cylinder wall near such end. The rotating cylinder or barrel is quite large, for example, having a length on the order of thirty feet and a diameter in excess of five feet.

A certain amount of loose or very easily dislodged sand is usually present in the feed to the mill, and as the amount of such waste sand in the charge increases relative to the amount of metal, the cleaning of the latter becomes progressively less efficient. That is, actual practice has demonstrated that excessive sand in the mill has a cushioning effect on the tumbling action, whereby the cleaning of the metal is impaired.

The new mill is accordingly provided with an additional sand discharge at the feed end. Such further discharge means is effective to drain off waste sand, as such, substantially as fast as it enters the mill, whereby the cleaning is fully accomplished at normal rates notwithstanding the inclusion of large amounts of loose sand. Thus no special attention or supervision of the feed is necessary for proper operation. This feature is of particular significance in large foundries, such as in the automotive industry, where the proportion of waste sand is apt to be quite high.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Fig. 1 is a side elevation of a sprue mill constructed in accordance with our invention;

Fig. 2 is a transverse section as viewed from the plane of the line 2—2 in Fig. 1;

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Fig. 3 is a further transverse section taken on the plane of the line 3—3 in Fig. 1; and

Fig. 4 is a fragmented section illustrating, on an enlarged scale, a cylinder wall formation.

Referring now to the drawing in detail, the mill comprises a cylindrical shell or barrel 10, which is open at both ends. Secured externally thereto, at the respective end portions, are riding rings 11 and 12 in the form of rolled steel tires serving cooperably with trunnion rolls to support the shell for rotation on its axis.

Ring 11 is thus engaged in its lower section by laterally spaced trunnion rolls 13 mounted by axle and bearing assemblies 14, with the latter being positioned a predetermined distance above the floor by standards 15. The ring 12 is similarly supported on trunnion rolls 16 held in axle and bearing assemblies 17 and positioned above the floor by a base 18. The base stand 18 is preferably of lesser vertical extent than the standards 15, whereby the shell is inclined to the horizontal as illustrated.

A gear 19 encircles the shell and in mesh with the same is a pinion 20 driven by an electric motor 21, through a conventional speed reducer 22. Such equipment, supported on a further base 23, of course forms a drive mechanism for rotating the cylinder on its inclined axis. Thrust rolls, not shown, will be employed at the sides of one of the riding rings to limit axial movement of the cylinder, in conventional manner.

The elevated end 24 is the feed end of the cylinder, and a transversely rounded delivery chute 25 extends a short distance into the same for receiving the sprues to be cleaned and directing the same into the mill. Any suitable loading arrangement can be used, for example, the mill can be loaded from pivoting cars, with a skip hoist or other conveyor means, or with lift truck dump boxes. In certain of these feed arrangements, e.g. in loading with a skip bucket, it may be possible to dispense with the chute and dump the charge directly into the open feed end of the cylinder. As shown in Figs. 2 and 3, the shell has on its inner surface a plurality of longitudinally extending tumbling bars 26 which assist in lifting and tumbling the sprues or other metal pieces in the transit of the same through the rotating shell.

A series of perforations 27 is provided in the shell in a section closely adjacent the upper feed end, such perforations extending completely about the periphery, and this perforated section is enclosed by a curved housing 28 having end walls 29 and downwardly convergent extensions 30 of its circumferential wall. The series of perforations 27, as shown in the drawing, form a perforate wall section of the cylinder of limited axial extent, with the outer end of the thus formed perforate wall section being spaced inwardly from the feed end of the cylinder a small distance which is clearly less than the internal diameter of the cylinder. The downwardly convergent extensions 30 form a downwardly open exit or discharge from the curved housing 28 enclosing this perforate wall section of the cylinder.

At the lower or discharge end 31 of the mill, the shell is provided with a further series of perforations 32 and an encircling housing 33 likewise having a lower chute portion 34, the shell rotating within the two such housings. A belt conveyor 35, suitably guided and supported by rollers some of which are shown at 36, extends beneath the shell, between side plates 37 and arranged commonly to receive discharge from the two housings 28 and 33. It will be recalled that the lower discharge end of the shell is open and, to receive material passing from the same, there is a transversely extending conveyor 40, which may be of oscillating or other suitable type, with one side of its upper course just beneath and slightly overlapped by the lower shell end.

In operation, the rotating barrel receives the charge

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of sprues or the like through the inclined feed chute and any waste sand included therein is quickly expelled through the perforations 27. This sand is collected in the housing 28 and delivered by the chute portion thereof to the belt conveyor 35. The metal parts, now free of excess sand, advance down the inclined shell and are subjected to a tumbling action, aided by the bars 26, effective to remove sand encrustation and to break up any large core lumps. This sand passes out through the slots or perforations 32 near the discharge end and onto the same conveyor 35, which will convey the sand to a suitable waste storage area. The now cleaned metal parts are discharged out such end of the cylinder and deposited on the conveyor 40 which transports them to a cupola or a place of storage.

The discharge end housing 33 has been shown provided with an upper port 38 for connection to a blower operative to suck air from the cylinder. This will produce air flow into the cylinder at both ends and is desirable to prevent the escape of dust into the foundry; if desired, the housing 28 may be similarly provided with a port and connected to the exhaust system. To increase the life of the shell, the same may be lined with inner wear-resistant bars 39, as illustrated in Fig. 4, these being replaceable.

It will accordingly be seen that this sprue mill is capable of handling large quantities of material in continuous operation with the by-pass for free sand provided by the feed end discharge assembly greatly enhancing the efficiency of the device, the initial sand removal ensuring that the metal pieces are jarred sufficiently by the tumbling to knock off encrusted mold sand. As indicated, the cylinder is usually inclined, but it can obviously be operated in horizontal position as well, in which case the build-up of material near the feed end causes the mass to move along the cylinder, with the time of passage through the latter being increased.

The conveyors described are of course particularly susceptible to change, with different types and arrangements being usable as desired or best suited to meet particular material-handling situations. For example, instead of one sand conveyor extending axially beneath the cylinder, two belt or other type conveyors can be disposed generally transversely of the cylinder respectively to receive the sand as discharged from the two housings.

Other modes of applying the principle of the invention may be employed, change being made as regards the de-

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tails described, provided the features stated in the following claim or the equivalent of such be employed.

We, therefore, particularly point out and distinctly claim as our invention:

- 5 A mill for cleaning sprues and the like of mold sand, comprising a hollow cylinder having feed and discharge ends, means supporting said cylinder for rotation on its axis at an inclination to the horizontal and with its feed end uppermost, drive means for thus rotating the cylinder,
- 10 means for delivering a charge of the sprues and the like to be cleaned to the cylinder at such feed end, a first series of sand discharge openings in the cylinder wall closely adjacent the feed end for discharge therethrough of loose sand included in the charge of the material, said
- 15 first series of sand discharge openings forming a perforate wall section of the cylinder of limited axial extent, with the end of the thus formed perforate wall section close to the feed end of the cylinder being spaced inwardly from the latter a small distance which is less than the
- 20 internal diameter of a cylinder, whereby loose sand in the feed is extracted through said first series of sand discharge openings before the material passes on through the rotating cylinder and is tumbled therein to separate the adherent sand, a second series of wall openings close-
- 25 ly adjacent the discharge end of the cylinder for removal of the sand separated from the sprues by the tumbling action, the cleaned sprues passing out the discharge end, said cylinder being imperforate between said first and second series of openings in the wall thereof, collector
- 30 means associated with each series of openings for containing the sand discharged through the same, and means for removing the sand from said collector means separately from such discharge of the cleaned sprues.

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