April 5, 1960 W. E. KELLY 2,931,060

LADLE SCULLING MACHINE

Filed Jan. 30, 1957 3 Sheets-Sheet 1

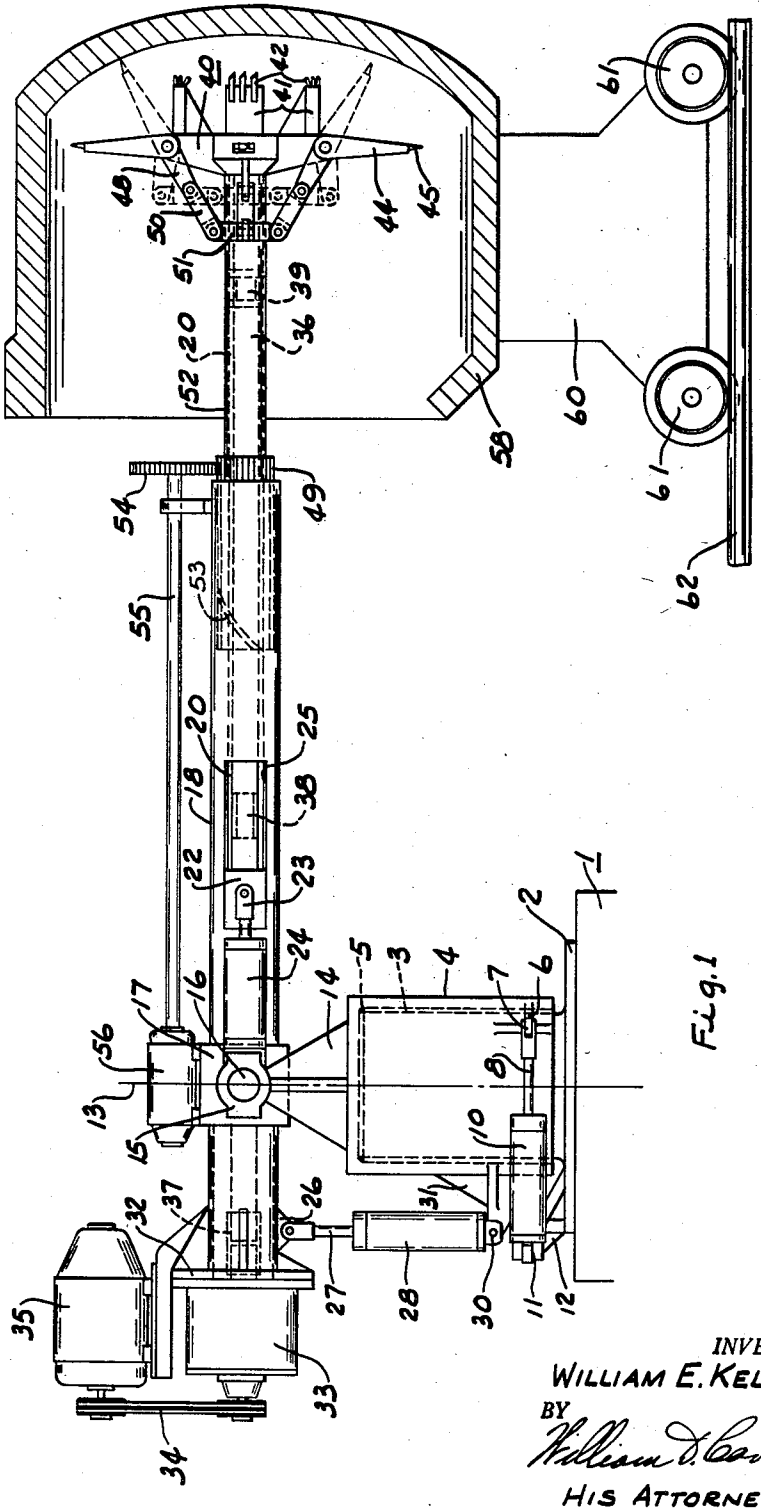


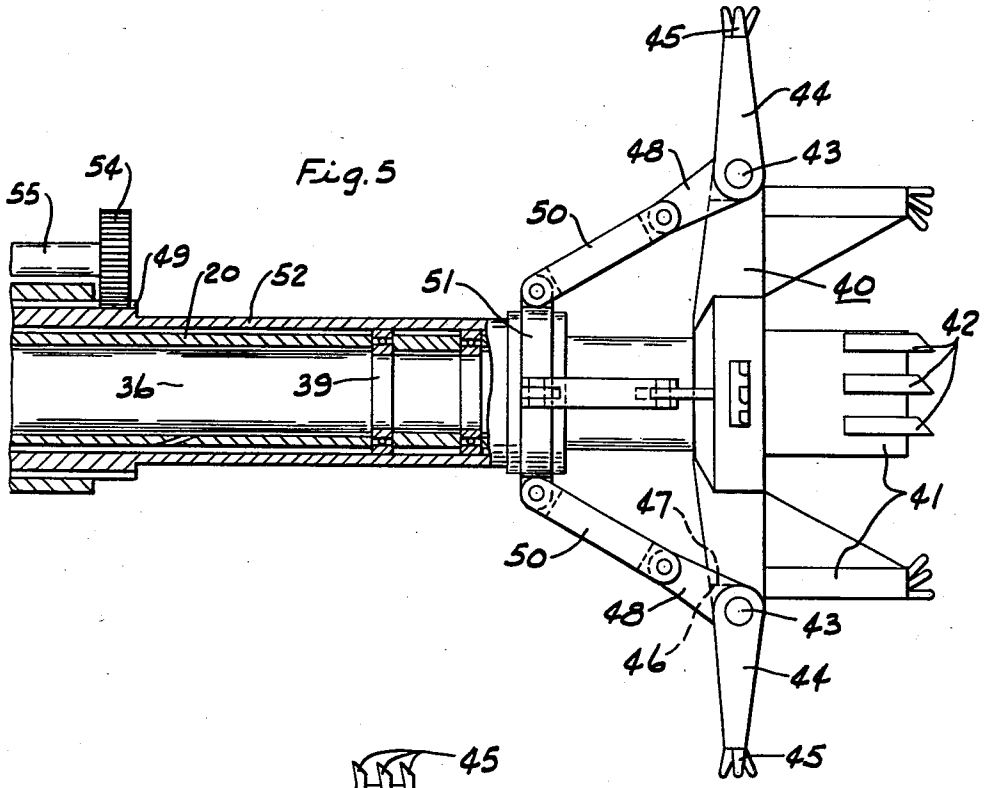
Fig. 1

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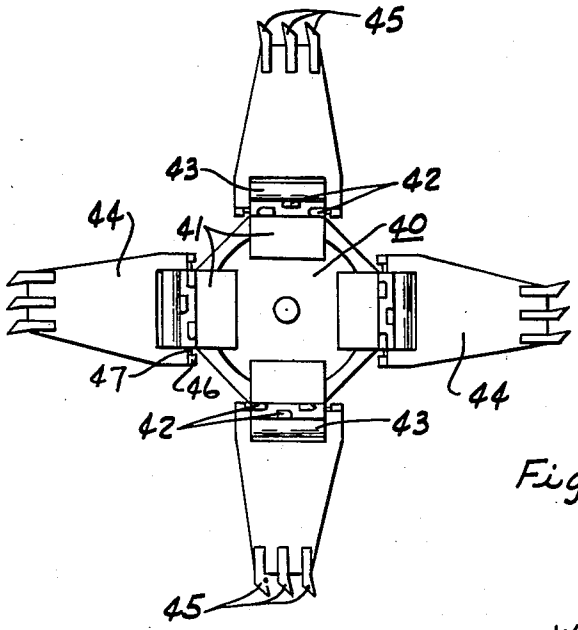


Fig. 2

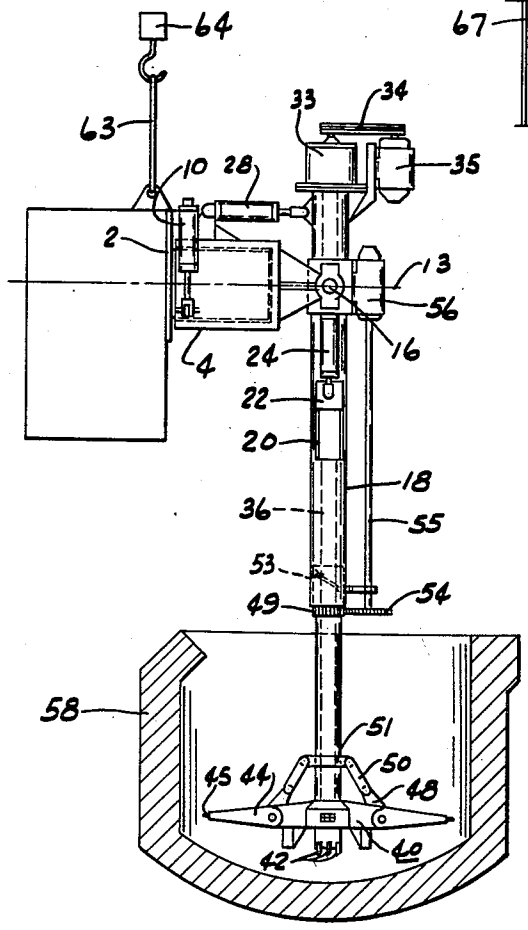
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Fig. 4



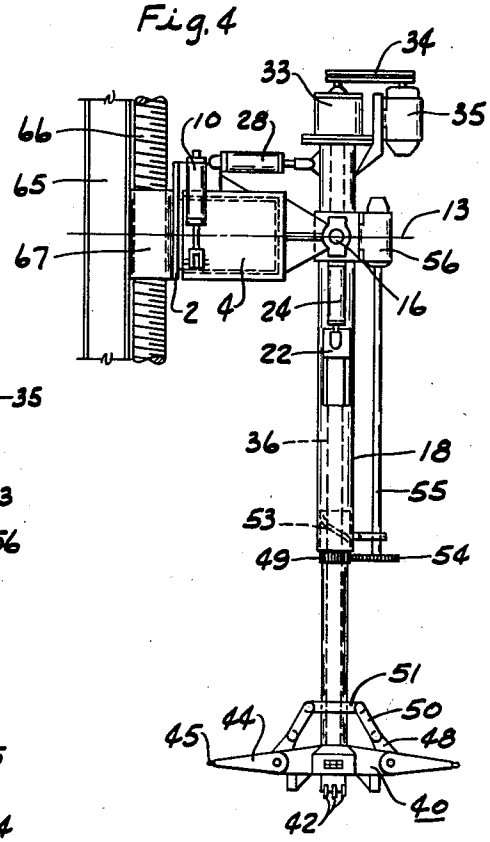


Fig. 3

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United States Patent Office 2,931,060 Patented Apr. 5, 1960

2,931,060

LADLE SCULLING MACHINE

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Application January 30, 1957, Serial No. 637,169

2 Claims. (Cl. 15—104.1)

This invention relates generally to ladle sculling machines and more particularly to a rotary cutting head for sculling a ladle to remove the residue before reusing the same.

The present practice in cleaning ladles is to dump them as soon as possible to eliminate any molten residue. The ladle is then placed under a crane from which is suspended an iron ball or a gang of hooks, both of which are rolled around in the ladle to fracture or catch on the scull and pull it out or break it loose. This treatment is hard on the ladle. Particularly if the ladle is lined with ceramic. The ceramic cannot stand much hitting or heavy impact or it will fracture and fall out.

The residue is usually very friable and a steel ball or a heavy gang of hooks usually produces more damage than is required to remove the scull. The principal object of this invention is the provision of a rotary cutter for use in chipping the scull from a ladle. This rotary cutter is mounted for rotation about an axis that may swing universally to chip and mill the scull in a ladle that has straight or overhanging walls without unduly injuring these walls by impact or cutting.

Another object is the provision of a ladle sculling machine having a rotary cutting head that has relative longitudinal movement as well as universal movement relative to a ladle to chip and cut the scull from the ladle.

Other objects and advantages of this invention appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting this invention or the claims thereto, certain practical embodiments illustrating the principles of this invention wherein:

Fig. 1 is a view in side elevation showing the sculling device operating on a tilted ladle carried on a truck.

Fig. 2 is a view in end elevation of the rotary cutting head.

Fig. 3 is a view in side elevation showing the sculling device suspended by a crane over a ladle carried on a truck.

Fig. 4 is a view in side elevation showing the sculling device mounted for axial reciprocal movement relative to the ladle being sculled.

Fig. 5 is an enlarged view partly in section showing the rotary cutting head and shaft.

Referring to the drawings the ladle sculling machine shown in Fig. 1 is mounted on the foundation 1 and comprises the pedestal 2 that has a vertical post 3 over which is mounted the cylindrical shell or turret member 4 having adequate bearings as indicated at 5 which permits the shell member to be rotated on the post.

The shell member is provided with a lug 6 having the eye 7 for pivotally receiving the end of the piston rod 8 that operates in the cylinder 10, the other end of which is pivotally secured as indicated at 11 to the bracket member 12 which is preferably formed integral with the pedestal 2. The piston 8 operating in the cylinder 10 is a double acting affair and fluid pressure exerted on either side of the piston will cause the cylinder 4 to

rotate about the vertical axis as indicated at 13. The structure shown is capable of swinging through 90° and if any greater arc is needed, it would be a simple matter to arrange the brackets 6 and 12 or to replace the same by a pinion and ring gear.

The upper end of the cylinder 4 has the spaced standards 14 that carry the bearings 15 to receive the trunnions 16. The trunnions 16 extend on opposite sides of the head 17 that supports the tubular casing 18. The tubular casing 18 provides a way in which the tubular extension member 20 is reciprocal and may telescope therein. The inner end of the extension 20 is connected to a crosshead 22 which in turn is secured to the outer end of the piston rod 23 that operates in the cylinder 24 that is attached to the head 17. This piston and cylinder arrangement is preferably located on each side of the housing so as to provide a uniform action when sliding the extension 20 in and out of the housing 18. The crosshead 22 slides in the slot 25 in the housing 18 when contracting or expanding the extension 20.

The housing 18 is also provided with a lug 26 pivotally connected to the outer end of the piston 27 that operates in the fluid cylinder 28 that is in turn pivotally connected as indicated at 30 to the bracket 31 to the cylindrical housing 4. Thus expansion or contraction of the piston 27 or the cylinder 28 causes the housing 18 to oscillate about the axis of the trunnions 16 which in most instances would be a horizontal axis.

The left end of the housing 18 is provided with a braced flange mounting 32 to receive the speed reducer 33 which is driven through the feed belt drive 34 from the motor 35 mounted above the speed reducer. The speed reducer has a coupling for the purpose of driving the shaft 36 which has an intermediate spline connection which is not shown for the purpose of permitting the extension 20 to telescope within the housing 18. The drive end of the shaft 36 is supported by suitable bearings 37 in the housing 18 and the extension 20 is provided with the spaced bearings 38 and 39 for the outer end of the shaft 36, the latter bearing being adjacent the outer end of the extension 20.

A cutter head 40 is mounted on the outer end of the shaft 36 and is provided with a series of fixed arms 41 which are spaced about the central axis of the head and are provided with cutting teeth such as illustrated at 42. At the base of the stationary arms 41, the head is provided with a pivot member 43 for pivotally supporting the arm 44 that carries the bits 45. Each arm 44 has a shoulder 46 that abuts against the shoulder 47 on the head to prevent the arm from traveling back any further than that which would form the greatest radial diameter in the cutting path of the teeth 45.

Each arm 44 is provided with a rearwardly extending integral lever 48 that is pivotally connected to the expansion arms 50 the other end of which is pivotally connected to a ring 51 mounted to have rotary relative movement on the end of a sleeve 52 which has an interior guide thread 53 operating in a complementary exterior guide thread on the extension 20. The end of the sleeve 52 is provided with a wide gear 49 that meshes with the pinion 54 that is operated by the shaft 55 and is driven by the reversible motor 56 mounted on the head 17. Thus by energizing the motor 56 one can vary the relative position of the cutter members 45 and cause them to collapse or open as illustrated in Fig. 1.

The ladle to be sculled 58 is carried by the car 60 which is mounted on the wheels 61 to operate on the track 62 to change the relative position of the cutter head with the ladle. Thus two means are provided to perform this function, the expansion or contraction of the extension 20 or the movement of the car 60 along a track 62. It will be noted that the head in its expanded position is

preferably not as large as the opening in the top of the ladle which permits the insertion of a light beam for watching and guiding the movement of the cutter head.

A structure such as illustrated in Fig. 3 shows the weighted base 2 of the ladle sculling machine supported by a cabling mechanism 63 from a crane 64 and operating to clean the ladle 58 standing upright on the floor. Here the operator has the additional flex by being able to raise or lower the whole of the machine relative to the ladle rather than moving the ladle in and out as shown in Fig. 1. In the structure shown in Fig. 4 the base 2 of the ladle sculling machine is mounted on a wall member 65 and is adjustable therealong by means of the rotary screw member 66 which operates in the threaded members 67 that support the base member 2. In this way a ladle can be moved by a car under the cutter head and the whole machine as well as the extension may be adjusted to cause the teeth on the cutting head to chip and mill out a skull in the ladle without endangering the ceramic lining.

I claim:

1. A sculling machine for removing the residue from the ceramic lining of a hot metal ladle having overhanging portions, comprising a base with a post having an outwardly extending axis, a turret mounted to rotate on said post about said axis, a housing mounted on said turret to pivot on an axis transverse to the axis of said post, a power-driven rotary shaft carried by said housing, a cutting head on the outer end of said shaft having cutters that extend laterally outwardly to chip the scull from the ceramic lining of said ladle, power means to tilt said housing and its rotary driven shaft about said transverse axis, power means to swivel said turret about the axis of said post to enable said cutter to remove the scull under the overhanging portions of said ladle, and feed means in the form of a ladle support movable

toward and away from said post and adapted to present the open mouth of said ladle to said cutter.

2. A sculling machine for removing the residue from the ceramic lining of a hot metal ladle having overhanging portions, comprising a base with a post having an outwardly extending axis, a turret mounted to rotate on said post about said axis, a housing mounted on said turret to pivot on an axis transverse to the axis of said post, a power-driven rotary shaft carried by said housing, a cutting head on the outer end of said shaft having cutters that extend laterally outwardly to chip the scull from the ceramic lining of said ladle, power means to tilt said housing and its rotary driven shaft about said transverse axis, power means to swivel said turret about the axis of said post to enable said cutter to remove the scull under the overhanging portions of said ladle, suspension means to hold said base suspended, said base providing a greater stabilizing mass than the mass of said post and the mechanism mounted thereon, the pivotal axes of said turret and said housing being transverse the gravitational line of said suspension means.

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