March 19, 1940. F. JOHANNESEN ET AL 2,194,282

FEEDING MECHANISM

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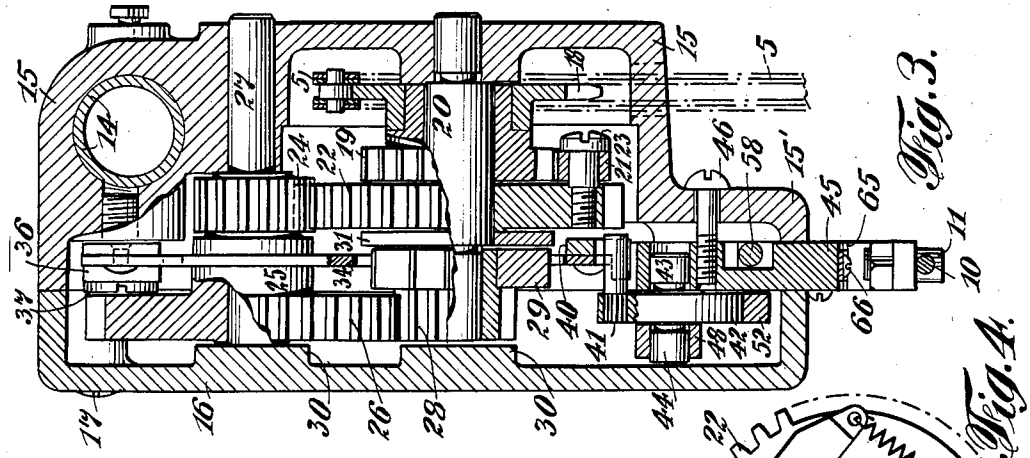


Fig. 3.

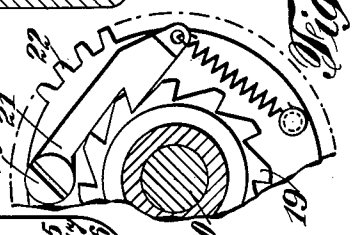


Fig. 4.

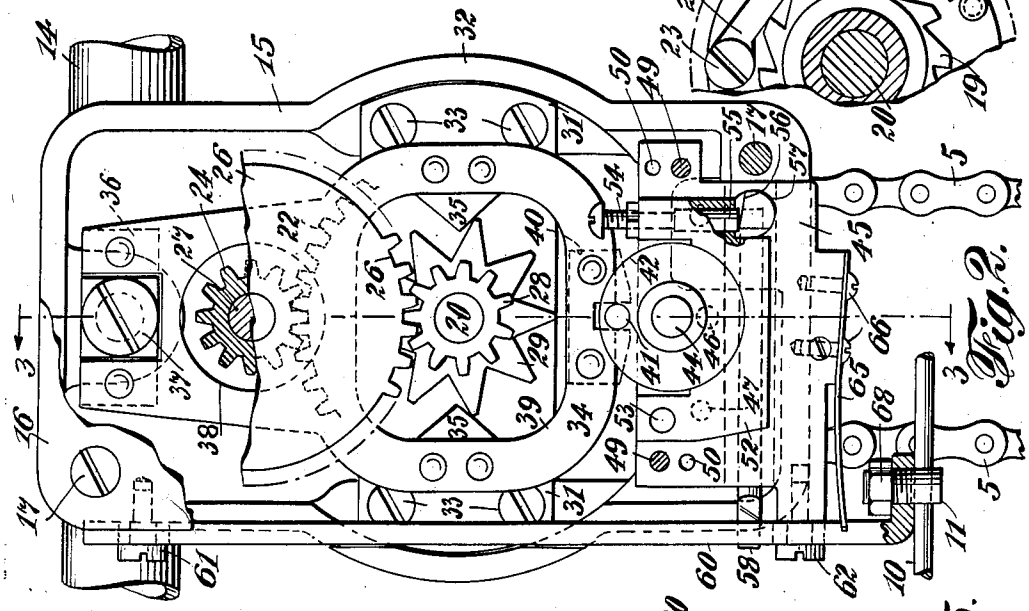


Fig. 2.

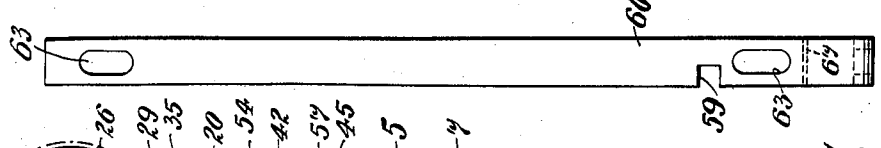


Fig. 5.

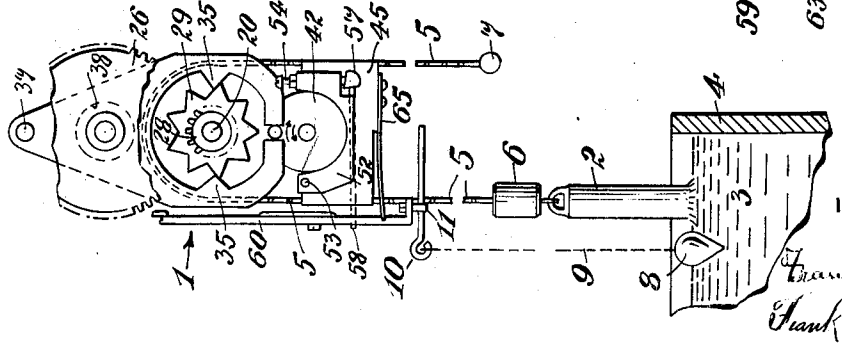


Fig. 1.

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FEEDING MECHANISM

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6 Claims. (Cl. 22—80)

This invention relates to feeding mechanisms adapted for releasing heavy weights and of which their movement is regulated by a substantially sensitive control. It especially relates to automatic feeding mechanisms adapted for releasing at intervals an ingot or pig touching the surface of a molten metal, whereby to maintain the surface of this metal at a substantially constant height while definite quantities thereof are withdrawn from the melting pot.

Automatic feeding mechanisms of this type are being used in type casting machines and the like; but while, in a general sense, such metal feeders are known to give a certain amount of satisfactory service, they nevertheless lack definite reliability and certain other necessary qualifications required by the industry.

It has been found that it is not alone essential to provide feeders which will give fairly satisfactory service, but it is also expected that they are absolutely reliable in operation during any period; that their mechanism is rugged and simple in design; that they are fool-proof, and that their release mechanisms, employed for controlling the feed device of the ingot, be very sensitive, so that the withdrawal of even a comparatively insignificant quantity of metal from the pot, will result at once into a definite response for a release of the ingot and causing it to move into the molten metal until its surface level has again reached its normal height.

A distinct advantage of such a sensitive and quick control is, that the capacity of the melting pot can be reduced and made comparatively small, so that not alone less space will be required for the pot, but the quantity of fuel for heating the metal is decreased.

It is therefore one of the objects of the present invention, to provide a feeding mechanism wherein the ingot release, which is actuated by a float swimming on the surface of the molten metal, is sufficiently sensitive to positively respond to a change in weight of the float, and which change is of a degree ranging to within a small fraction of the actual weight of the float.

It is another object of this invention, to provide a feeding mechanism with a pendulum escapement for actuating a stop member, whereby to not alone make the operation of the mechanism positive and reliable, but to also furnish a design, which is compact, rugged and not susceptible to outside interferences.

A further object of the invention is to provide an effective control-brake device, and this of a type, wherein the brake surfaces can be hardened without causing slippage. The life of the feeding mechanism, due to the absence of wear on these hardened surfaces, is thereby prolonged indefinitely.

These and other objects which will be pointed out more specifically in the specification and the claims, are attained by the invention disclosed in the drawing, wherein:

Fig. 1 is a front elevational, partly diagrammatic view of the metal feeder, shown applied in operative association with a melting pot.

Fig. 2 is an enlarged front elevation of the metal feeder, with its cover almost completely removed.

Fig. 3 illustrates a side elevation of the metal feeder, on line 3—3, Fig. 2.

Fig. 4 shows a partial rear view of a ratchet drive, and

Fig. 5 a side view of a control element.

Referring to the drawing, the automatic metal feeder 1, is of a self-actuating type. It is independent of any moving parts of the type casting machine and is therefore not operated by any pre-determined stroke of some lever on the machine. The release of the ingot 2 is solely depending on the height of level of the metal 3 in the metal pot 4, thereby insuring an even flow of metal in direct proportion to the amount withdrawn.

The ingot or pig 2, which is connected to the feeder 1 by means of a chain 5, has at its top an auxiliary weight 6, which serves no other purpose but to supply sufficient weight for continuing the operation of the feeder mechanism while the length and therefore the pulling force of the ingot has been reduced to almost nothing, or at least to a small fraction of its former size. When this occurs, the circular stop member 7 at the other end of the chain 5 will have reached an obstruction on the feeder housing and thus prevent the auxiliary weight 6 from moving into the molten metal.

The iron float 8, swimming on top of the metal surface, is suspended by a light-weight chain 9, which is fast to a transversely located pin 10, adjustably held in a threaded binding post 11, Fig. 2. The float 8 may thus be located in almost any position, depending on the location of the melting pot and the shape of its opening.

The operating mechanism of the metal feeder 1 is confined within a cast metal housing 15, adjustably mounted to a stationary tube or rod 14.

A cover 16 is held to the top surface of the housing by suitable screws 17.

The feeder chain 5 engages the sprocket wheel 18, which is fast to a ratchet wheel 19 freely rotatable on a shouldered stud or post 20, which is either driven or screwed into the bottom part of casing 15. A spring operated pawl 21, adapted to engage the teeth of the ratchet wheel 19, is movably held on a driving gear 22 by means of a shouldered screw 23. Gear 22 engages an intermediate pinion 24 which is fast to the hub 25 of an intermediate gear 26 freely rotatable with pinion 24 on a stationary pin 27 driven into the base of casing 15.

Intermediate gear 26 engages a driven pinion 28, to which is securely held an escapement or star wheel 29. The driven pinion with its star wheel is free to rotate on the shouldered stud or post 20. Suitable lugs 30 on the inner surface of cover 16 serve the purpose to position both the gear 26 and the driven pinion 28 in an axial direction.

In order to positively maintain the stationary post 20 in a rigid condition, a bearing plate 31 is provided, which snugly fits onto the rounded inner surfaces of the casing wall 32 and which is held to the casing by flat head screws 33.

The driving force exerted by the ingot on the sprocket wheel will tend to rotate the sprocket and the star wheel in a counter-clockwise direction. When rotating, their speed will be retarded however by the presence of an escapement lever or pallet arm 34 of the pendulum type and of which its pallets 35, placed 180 degrees apart, interact with the teeth of the star wheel, thereby causing the arm 34 to oscillate.

The escapement lever 34, which is preferably made of sheet metal, has riveted to its upper end a T-shaped bearing block 36, adapted to receive a shouldered fulcrum screw 37 which is held in the middle of the extreme upper section of housing 15. Underneath this screw an opening or clearance hole 38 is provided in arm 34 for clearing the circular hub 25. Below this opening, a still larger clearance hole 39 in arm 34 is adapted to permit the star wheel to rotate within the confines of the escapement arm.

At the lower end part of this swinging arm is riveted a grooved pin-engaging block 40, adapted to operatively connect with a circular pin 41, which is securely fastened to an oscillatable brake drum 42, provided at both of its faces with trunnions or pivot pins 43, 44.

Trunnion 43 is rotatably held in a mounting block 45, which is secured to casing 15 by a screw 46 and rigidly positioned by two steady pins on this block and entering the base of casing 15. A bridge member 48, supporting trunnion 44, is held to the upper surface of the mounting block by means of screws 49. The bridge member's feet (not shown) are provided with suitable steady pins adapted to enter the holes 50 adjacent the screws 49.

In order to control the number of strokes or oscillations required for the release of a definite quantity of pig metal, a sensitive control device is provided and which comprises a hardened brake lever 52, adapted to engage the hardened cylindrical surface of the brake drum 42. The brake lever is fulcrumed on a pivot pin 53, fast in the mounting block 45 and has at its other extremity an adjustable screw and nut 54, which are adapted to regulate the height of a hardened contact pin 55, of which its lower surface engages a hardened lever surface 56 of a cylinder 57 rotatably held at both its end portions in the mounting block 45 and the recessed housing section 15' respectively.

The cylindrical force lever 57 is provided with a rod 58, extending from the right side to the left and to the outside of the casing, where it engages an indent 59 in a movable beam or control bar 60. The latter is held vertical and is guided by shoulder screws 61, 62, engaging slots 63 of said bar. The thread of the upper screw 61 engages the wall of casing 15, while the lower screw 62 is held in the lower end portion of mounting block 45 protruding from the casing.

The weight of the vertically movable bar 60 is overcome by a flat spring 65, secured to the lower surface of block 45 by suitable screws 66 and which is adapted to engage at its free end a slot 67, cut transversally on the inner, wide surface of bar 60.

The lower end part of this bar is bent at right angle and is adapted to maintain the threaded post 11 which, with its float supporting pin 10, may be rotated into any suitable position and thereafter locked by means of a nut 68. The narrow front surface of bar 60 is flush with the upper surface of the mounting block 45, which again is substantially flush with the finished upper surface of casing 15.

The function of the flat spring 65 is, to not alone lift the vertical bar 60 with the attached light-weight chain 9, but to also press the hardened brake lever 52 against the brake drum 42 by means of the force lever 57, 58 engaging bar 60.

For the reason that the star wheel 29 has been speeded up by a gear ratio of approximately 6:1; that the blows of this wheel are received by the angular faced pallets of the pendulum, and that furthermore an increased leverage in this pendulum actuates the brake drum 42, it is evident, that the force still residing in this drum will be comparatively small.

To arrest the movement of the oscillating drum by the small force of the flat spring 65, the pivot pin 53 of the brake lever 52 has been located in a most favorable manner relative to the adjustable contact pin 55 at its other end, so that the force required on the brake lever is reduced by more than three times the amount needed for stopping the drum. This leverage has been further augmented by a greatly magnified lever ratio, obtained by the construction of the very short force lever 57 and its lengthy extension 58, engaging the vertical beam 60. The active movement of the brake lever 52 to and from the brake drum may thus be made extremely short, requiring less than $\frac{1}{64}$ of an inch travel.

It is therefore quite evident, that the spring power required for arresting the oscillating movement of the brake drum is very small, and that in consequence thereof, the least amount of variation on the surface of the molten metal and therefore on the weight of the float 8, will at once cause a definite and very reliable reaction on the feeding mechanism.

It has been found by actual tests, that the force required to either release or to arrest the movement of the approximately twenty-five pound weight of the ingot 2, by means of the lever 58, is not more than three ounces. Even though both the contact surfaces of the brake drum 42 and the brake lever 52 are hardened and polished, a three ounce force, coming from either the float chain 5 or the reacting spring 65, will therefore definitely operate the feeding mechanism without

causing slippage. That the sensitiveness of the mechanism described, is bound to increase the efficiency in type casting operations, may be derived from the simple fact, that if during a type casting period of say 15 minutes, the ingot would drop only 5 instead of 15 or 20 times, the heat of the molten metal in the pot would, in the first instance, have to melt a larger quantity of cold ingot metal than in the other. Should the operator cast large slugs, leads or rules, it is evident, that if the ingot does not feed almost continuously, but during long intervals only, its metal can not melt fast enough to keep up with the metal withdrawn. The result is, that the feeding mechanism keeps dropping cold metal into the pot, which may result into a so-called "low pot", and of which the effect would be hollow instead of full castings or slugs.

The pig may ultimately rest on the bottom of the pot and under extreme conditions, may even unhook from the feeder chain. Should the operator leave the machine and not notice that all of the cold ingot metal had not been melted, the gradually dissolving metal could create an overflow of metal from the pot, which might damage electrical and other parts of the machine.

Even though the operator should be careful in overcoming the above mentioned possible defects, he would, nevertheless, be forced to slow up production, on account of the ingot metal melting slower when not fed in short and progressively continuous steps during high speed type casting operations.

Raising the degree of sensitiveness of the float-operated release mechanism, will therefore produce the novel result of eliminating possible defects which might occur during type casting operations, and by furthermore increasing the efficiency. The latter would be characterized by a higher speed in production and a consequent reduction in cost of operation.

The invention described, comprises therefore a novel self-actuating type of metal feeder which is independent of any pre-determined actions or strokes of an outside machine and which feeder reacts to the slightest depletion of metal from the melting pot. Its locking action is positive, permitting no slippage. This in turn permits the introduction of hardened surfaces at places where wear might occur, extending thereby the life of the mechanism by a considerable degree.

Due to the sensitiveness of the releasing action, this feeder can therefore be applied for melting off the very last piece of metal of the ingot or pig, if so desired. In order to place a new ingot onto the chain 5, the operator will simply pull down the chain disk 7. This will make the ratchet device operate until the ingot carrying weight 6 has been raised to the height desired.

Having described the invention, it is evident, that various modifications thereof may be apparent to those skilled in the art, without departing from the spirit and scope of the invention, and it is therefore understood that the same is only to be limited by the scope of the prior art and the appended claims.

What we claim is:

1. A feeding device of the type adapted to feed metal ingots to a melting pot, comprising a casing, an element carrying an ingot to be fed to the pot and driven by the weight of said ingot, gearing driven by said element, supports for said gearing, a star wheel driven by said gearing, and an escapement lever driven and oscillated by said star wheel, said supports being sustained in said casing and located to penetrate the plane of operation of said lever, the form of said lever being adapted to permit said supports to extend from the rear to beyond the front surface of said lever, whereby to substantially decrease the magnitude of space required for said feeding device, a brake element oscillatably driven by said escapement lever and having a friction surface, and a friction lock lever adapted to engage said friction surface, whereby to stop the movement of said ingot.

2. A feeding device of the type adapted to feed metal ingots to a melting pot, comprising an element carrying an ingot to be fed to the pot and driven by the weight of said ingot, gearing driven by said element, a star wheel driven by said gearing, and an escapement lever driven and oscillated by said star wheel, a brake element oscillatably driven by said escapement lever and having a friction surface, a friction lock lever adapted to engage said friction surface, a float-operated lever operatively associated with said friction lever, whereby to compound the leverage and to increase the sensitiveness of operation of said friction lock lever, and means for varying the space relation required for sensitiveness in operation between said brake element and said lock lever.

3. A feeding device of the type adapted to feed metal ingots to a melting pot, comprising a casing, an element carrying an ingot to be fed to the pot and driven by the weight of said ingot, gearing driven by said element, supports for said gearing, a star wheel driven by said gearing, and an escapement lever driven and oscillated by said star wheel, said supports being sustained in said casing and located to penetrate the plane of operation of said lever, the form of said lever being adapted to permit said supports to extend from the rear to beyond the front surface of said lever, whereby to substantially decrease the magnitude of space required for said feeding device, a brake element oscillatably driven by said escapement lever and having a friction surface, and a friction lock lever adapted to engage said friction surface whereby to stop the movement of said ingot.

4. A feeding device of the type adapted to feed metal ingots to a melting pot, comprising a casing, an element carrying an ingot to be fed to the pot and driven by the weight of said ingot, gearing driven by said element, supports for said gearing, a star wheel driven by said gearing, and an escapement lever having a support and being driven and oscillated by said star wheel, said gearing supports being sustained in said casing and located to penetrate the plane of operation of said lever and being arranged with said lever support in a substantially straight line, the form of said lever being adapted to permit said gearing supports to extend from the rear to beyond the front surface of said lever, whereby to substantially decrease the magnitude of space required for said feeding device, a stop element operatively associated with said escapement lever, a lock lever adapted for engaging and disengaging said stop element and a float-operated lever operatively connected with said lock lever whereby to compound the leverage and to increase the sensitiveness of operation of said lock lever.

5. A feeding device of the type adapted to feed metal ingots to a melting pot comprising an element carrying an ingot to be fed to the pot and

driven by the weight of said ingot, gearing driven by said element, a star wheel driven by said gearing, an escapement lever driven and oscillated by said star wheel, a brake element oscillatably driven by said escapement lever and having a friction surface, and a friction lock lever adapted to engage said friction surface, whereby to stop the movement of said ingot.

6. In an automatic feeder mechanism of the type adapted to feed metal ingots to a melting pot, a gear train, an ingot carrying conveyor operatively connected to one end of said gear train, escapement mechanism operatively connected to the other end of said gear train, brake means for selectively engaging or disengaging said escapement mechanism, and means responsive to the metal level in said pot for operating said brake means.

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