May 11, 1937. H. G. R. BENNETT 2,079,833

KICK-OFF OPERATING MECHANISMS

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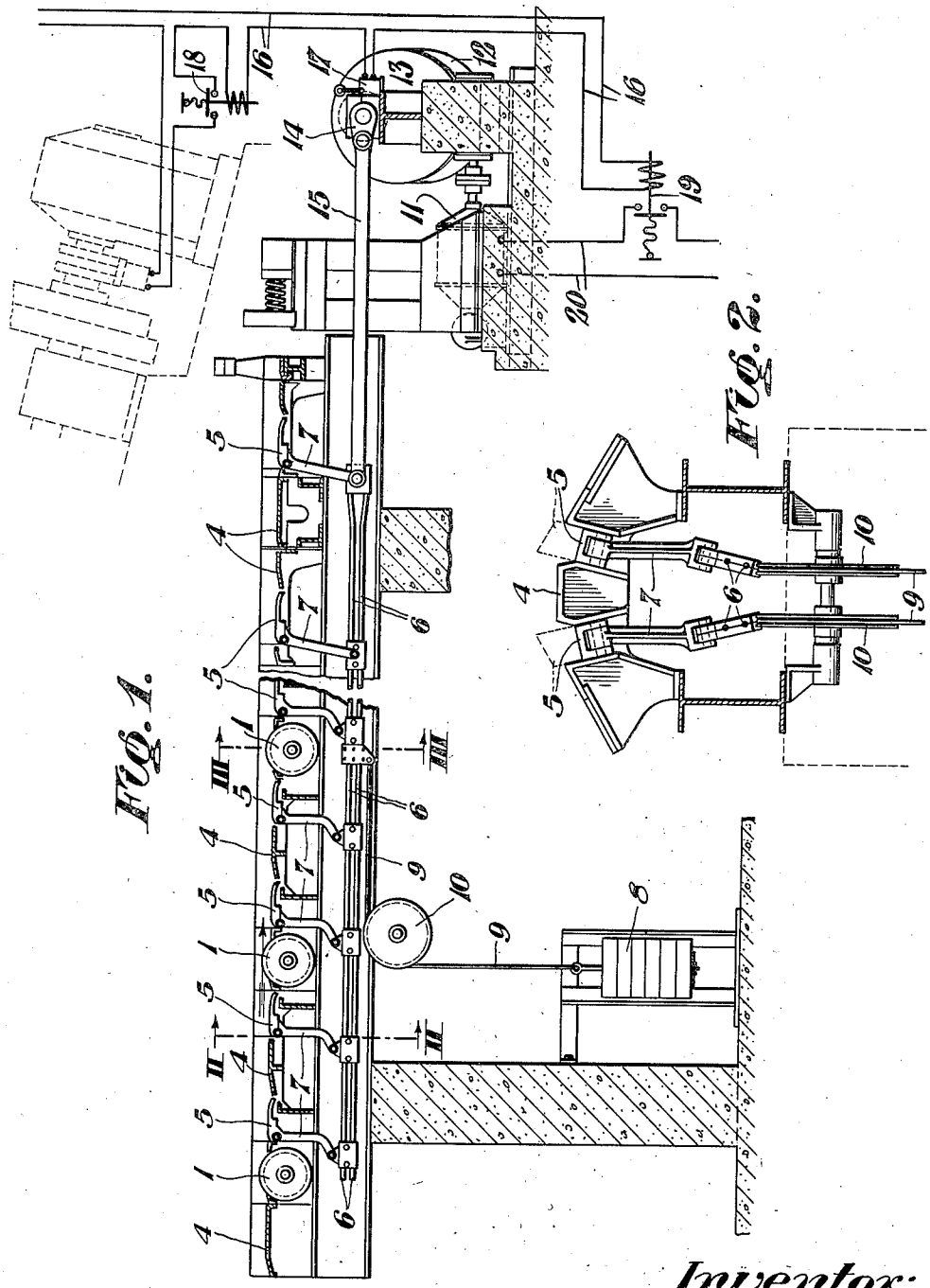


FIG. 1.

FIG. 2.

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Fig. 3.

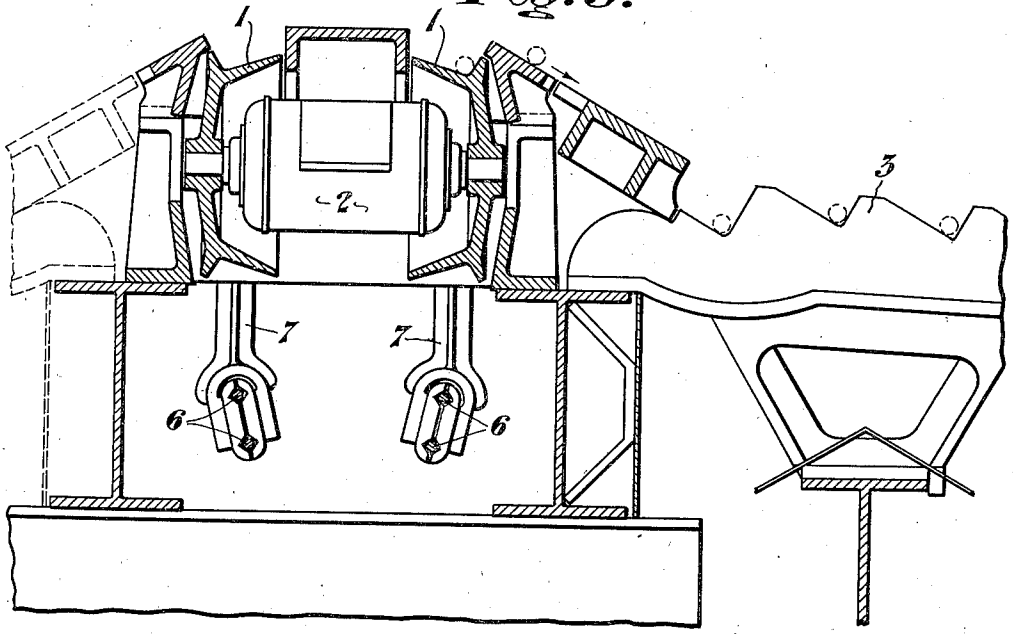
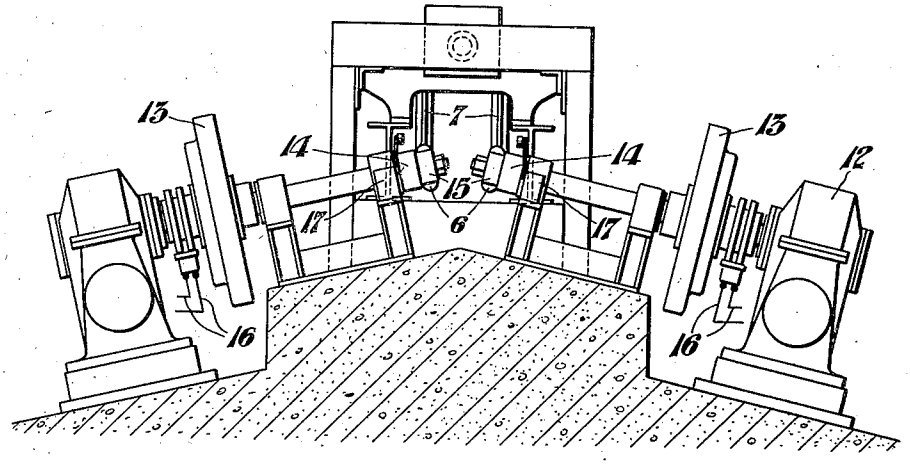


Fig. 4.



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KICK-OFF OPERATING MECHANISMS

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Application December 8, 1934, Serial No. 756,695

3 Claims. (Cl. 198—27)

This invention relates to reciprocative device operating mechanisms, and is particularly concerned with steel mill runout kick-off operating mechanisms, the object being to provide a mechanism of this character which is sufficiently sturdy and reliable to meet the abuse and demands incidental to steel mill usage and, particularly, to provide a mechanism for operating a kick-off with a sufficiently quick return to accommodate the high speed production of a modern bar mill. Other objects may be inferred.

A specific example of a bar mill hot run-out having a kick-off operated by a mechanism embodying the principles of the present invention is illustrated by the accompanying drawings, in which:

Figure 1 is a longitudinal section of the run-out and kick-off and side elevation of the operating mechanism for the latter.

Figure 2 is a cross-section from the line II—II in Figure 1.

Figure 3 is a cross-section from the line III—III in Figure 1, and includes a portion of the cooling bed with which a run-out of the type shown is generally associated.

Figure 4 is an end elevation of Figure 1.

Referring to these drawings, the run-out consists of a series of spaced parallel rollers 1 which are mounted by the armature shafts of a series of electric motors 2. This particular run-out serves to carry the bars from a bar mill to two cooling beds arranged on either of its sides, and therefore each of the armature shafts mounts two of these rollers. A portion of one of these cooling beds, marked 3, is illustrated by Figure 3 to show its relation to the run-out.

A series of fixed plates 4 partially span the spaces between the rollers 1 for the purpose of guiding the advancing ends of bars from one of these rollers to another. Another series of plates 5 complete the spans between these rollers, and these latter plates are pivoted so as to swing above the latter so as to laterally discharge the work onto the cooling bed. These plates 5 swing upwardly in unison and constitute the kick-off for the run-out.

Since the run-out is carrying steel bars which are of fair weights and travel at rather rapid speeds, it is obvious that the kick-off and any mechanism which may be used to operate it must be of a rather rugged character. Furthermore, a modern bar mill delivers its bars in extremely rapid succession, and it is likewise obvious that this kickoff must be returned very quickly after each operation so that it may be in a position to permit passage of the next bar. Finally, it is apparent that failure of the mechanism operating the kick-off must result in an accident which may cause property damage or personal injury to workers, or both. If these various requirements are kept in mind, the advantages of the operating mechanism now to be described will be more fully appreciated.

This mechanism includes a tension bar 6 arranged below the rollers 1 and linked to the plates 5 by levers 7, whereby reciprocation of this bar swings all of the plates 5 simultaneously. A weight 8 is connected to the bar 6 by way of a cable 9 bent over a sheave 10 so as to continuously apply tension to it in a direction which holds the plates 5 down. In other words, this weight 8 continuously urges the kick-off to its inoperative position.

A motor 11 drives through a worm gearing 12 and an electric clutch 13 so as to rotate a crank 14, the latter being connected to the tension bar 6 through a connecting-rod 15. This clutch 13 is interposed between the gearing 12 and the crank 14, and is energized by an electric line 16 in which a limit switch 17 is placed, the latter being so positioned that it is operated after the crank 14 has been thrown a distance sufficient to effect operation of the kick-off. The leverage of the mechanism being now described is such that the limit switch should be operated upon approximately a 135 degree throw of the crank 14 from the position to which the latter is normally urged by the tensioned condition of the bar 6.

It is to be understood that the limit switch 17 may be of any conventional type, since it simply functions to deenergize the clutch 13 after the motor 11 has operated the kick-off. It is, of course, necessary to provide a suitable control for the motor 11 as well as some system for holding the clutch 13 deenergized during the return of the kick-off. Any competent mill electrician should be easily capable of providing the required arrangements.

A purely diagrammatic example of such an arrangement is illustrated by Figure 1, the line 16 being in series connection with the solenoids of two relays 18 and 19, the contacts of the relay 18 being also in series with the line 16 and the contacts of the relay 19 being in series with a line 20 that powers the motor 11. Operation may be effected by manually closing the contacts of the relay 18, this energizing the line 16 and closing the contacts of the relay 19. Until the limit switch 17 is opened by the crank 14 the motor 11 and the electric clutch 13 will be ener-

gized. As soon as the switch 17 is opened the solenoid of the relay 18 will be deenergized so that the contacts of this relay open. Likewise, the solenoid of the relay 19 will be deenergized so that the circuit through the line 20 will also be broken. Since these relays are of the type which must be held closed by energization of their solenoids, it is obvious that operation can only be again secured by manually closing the contacts of the relay 18.

It is to be understood that the system just described must ordinarily include the usual motor accelerating and protective devices, etc., these not being shown in the interest of simplicity.

Assuming a bar to be traveling over the run-out and reaching a position where operation of the kick-off is desirable; the motor 11 is energized so that the crank 14 is turned to pull the bar 6 against the force of the weight 8, the bar 6 operates the kick-off so that the work is discharged from the run-out to the cooling bed, the crank 14 by this time throws the limit switch 17, the latter effects releasal of the electric clutch 13 and the weight 8 immediately returns the kick-off to its inoperative position.

It is obvious that the motor, gearing, tension bar, levers 7 and kick-off itself may be made extremely strong and heavy without interfering with the quick return of the latter, since this return is effected by the weight 8 immediately upon the release of the clutch 13. Falling scale, vibration, shock and the other abuses to which the mechanism will undoubtedly be subjected cannot cause the harm which might be expected if the mechanism were of sufficiently light construction to provide for a quick return through the medium of a motor. It should also be noted that a breakdown on the part of the electric motor 11 will not result in the kick-off remaining in its discharging position, since the weight 8 will immediately return to its inoperative position. This means that the work will simply pile upon the rollers 1 instead of resulting in an accident close to the mill where men might be injured by cobbling of the work.

I claim:

1. The combination of a series of spaced parallel rollers, a series of plates pivoted between said rollers so as to swing thereabove, a tension bar arranged below said rollers and linked to said plates so as to simultaneously swing the same, a weight connected to said bar so as to continuouly apply tension to it so as to hold said plates down, a crank, a connecting-rod between said crank and said bar, a motor, gearing and an electric clutch between said motor and said crank and effecting a drive therebetween, and a limit switch arranged for operation by rotation of said crank and electrically connected to effect releasal of said clutch.

2. The combination of a run-out, a kick-off for said run-out, means for continuously urging said kick-off to its inoperative position, a motor, releasable means for connecting said motor to said kick-off so that operation of the former forces the latter to its work-discharging position and means responsive to the arrival of said kick-off at its second named position for effecting releasal of the second named means.

3. The combination of a run-out, a kick-off for said run-out, means for continuously urging said kick-off to its inoperative position, a motor, releasable means for connecting said motor to said kick-off so that operation of the former forces the latter to its work-discharging position and means responsive to the arrival of said kick-off at its second named position for effecting releasal of the second named means, the first named means urging said kick-off with sufficient force to return it to its inoperative position upon operating failure of said motor.

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