

Feb. 6, 1945.

C. N. REESE

2,368,615

TONGS MECHANISM

Filed Dec. 3, 1943

2 Sheets-Sheet 1

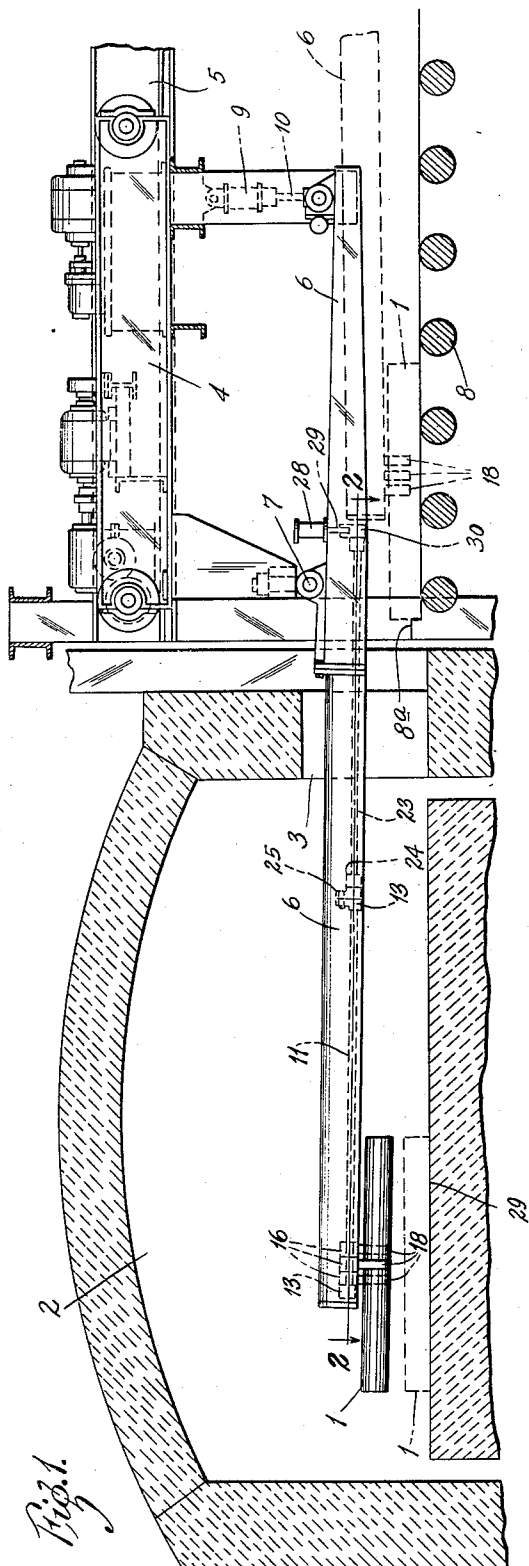


Fig. 1.

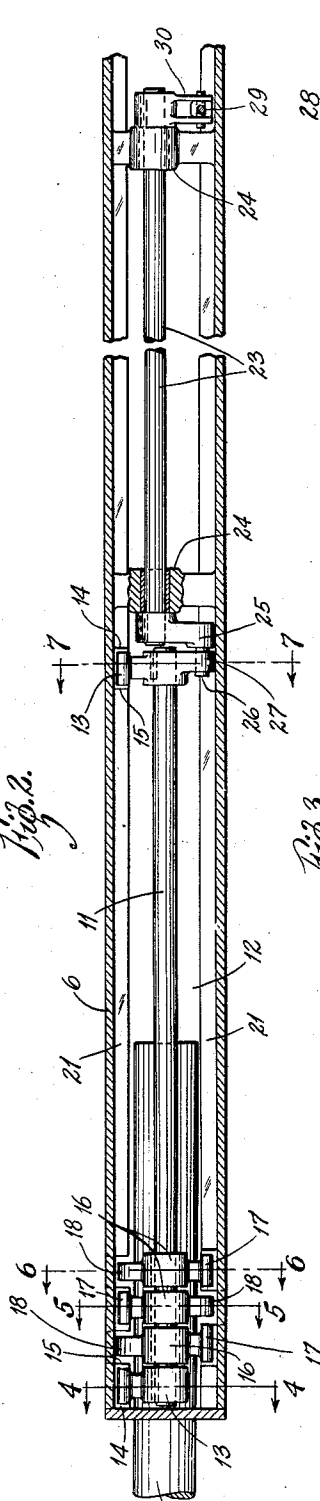
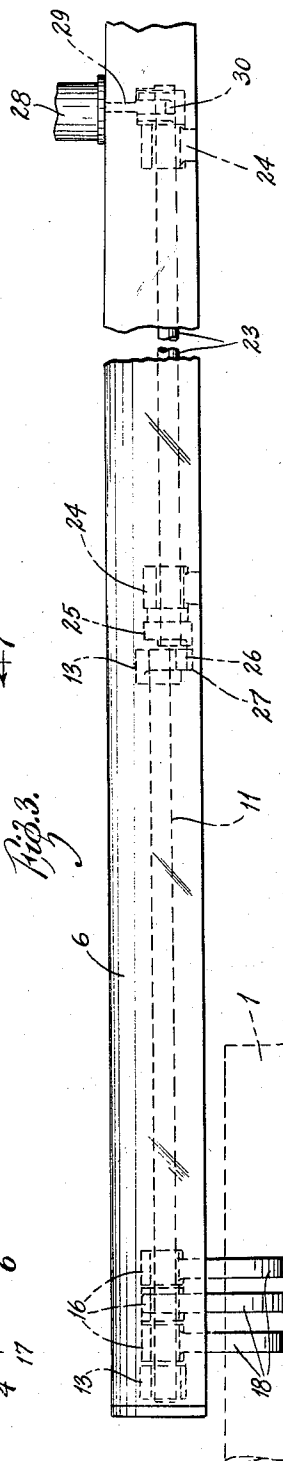


Fig. 2.



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Fig. 4.

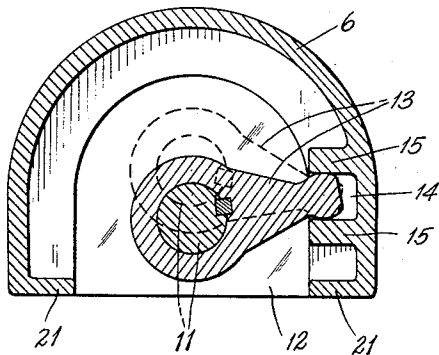


Fig. 5.

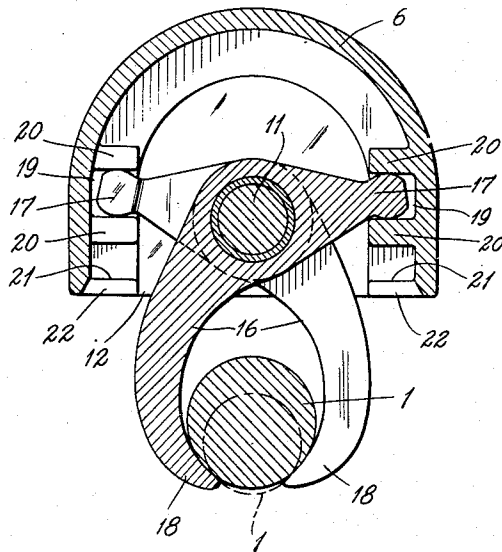


Fig. 6.

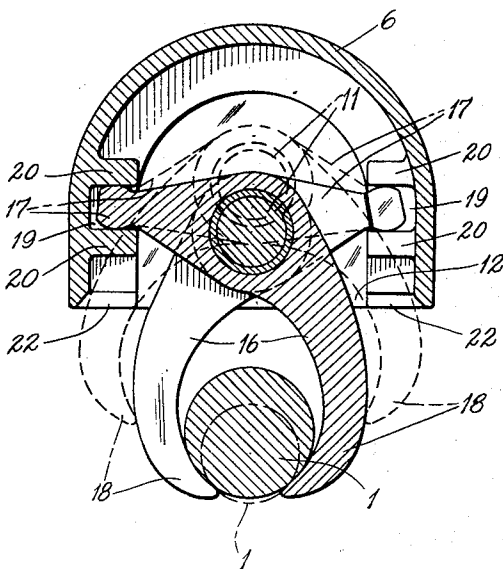
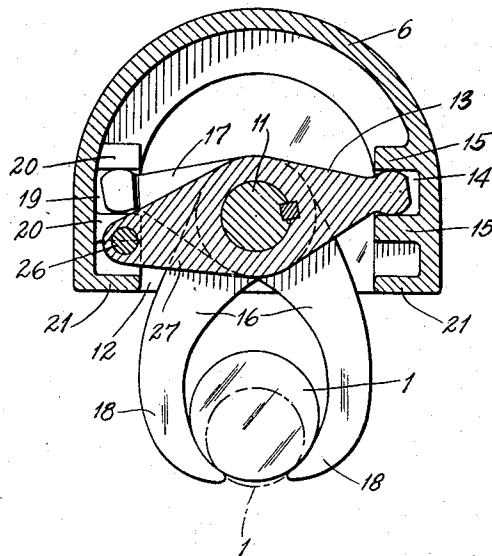


Fig. 7.



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UNITED STATES PATENT OFFICE

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TONGS MECHANISM

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Application December 3, 1943, Serial No. 512,750

4 Claims. (Cl. 214—27)

This invention relates to tongs mechanism, particularly tongs mechanism of billet charging machines for rotary hearth furnaces. The invention has for its principal objects to devise a simple and economical, easily operable billet tongs mechanism that is readily accessible and easily repaired and will operate in high temperatures. The invention consists in the tongs mechanism and in the parts and combinations and arrangements of arts hereinafter described and claimed.

In the accompanying drawings, wherein like symbols refer to like parts wherever they occur.

Fig. 1 is a side elevational view of a billet charging machine provided with a tongs mechanism embodying my invention, the charging machine being shown extending into a furnace, which is shown in vertical section,

Fig. 2 is an enlarged horizontal sectional view taken on the line 2—2 through the tongs supporting housing of the billet charging machine,

Fig. 3 is a side elevational view of the parts shown in Fig. 2; and

Figs. 4, 5, 6 and 7 are enlarged vertical cross-sectional views on the lines 4—4, 5—5, 6—6 and 7—7, respectively, in Fig. 2.

In the accompanying drawings, my invention is shown embodied in a machine for inserting billets 1 into a rotary hearth furnace 2 through an opening 3 in the side wall thereof. The billet charging machine illustrated in the accompanying drawings comprises a suitable self-propelled wheeled carriage 4, which is movable towards and away from the furnace opening 3 along an overhead track 5, and a substantially horizontally disposed elongated peel or tong supporting housing 6 pivotally suspended, as at 7, from said carriage for limited vertical tilting movement above a suitable roller table 8 for positioning the billets 1 against a stop 8a provided therefor immediately in front of the furnace opening 3. The housing 6 is tilted by means of a fluid cylinder 9 that is pivotally connected at its upper end to the carriage 4 and has a depending piston rod 10 pivotally secured to the rear end of said housing. The housing 6 extends forwardly beyond the front end of the carriage 4 and is adapted to extend into the furnace 2 through the billet receiving opening 3 therein when the carriage is advanced to the furnace.

The housing 6 is provided with a billet gripping tongs mechanism comprising a floating shaft 11 mounted in and disposed longitudinally of the forwardly extending portion of said housing above an opening 12 along the bottom thereof.

The opposite ends of the floating shaft 11 have arms 13 rigid therewith that preferably extend on one side thereof and have their ends supported or confined in inwardly opening pockets or recesses 14 provided therefor in the adjacent side wall of the housing 6. The pockets 14 are formed by pairs of vertically spaced lugs 15 that project inwardly from the side wall of the housing 6; and the pocket engaging ends of the arms 13 are convexly curved to permit vertical rocking or pivotal movement of said arms in said pockets.

Rotatably mounted on the floating shaft 11 adjacent to the forward end thereof are two or more levers 16 that cooperate to form billet gripping tongs. Each of the levers 16 has at one end an operating arm 17 that extends laterally from one side of the floating shaft 11 and at the opposite end a billet grasping arm 18 that curves downwardly on the other side of said shaft and extends downwardly through the opening 12 in the bottom of the housing 6 and terminates therebelow in an inwardly hooked lower end. The levers 16 are arranged on the floating shaft 11 with an operating arm 17 of one lever and a work grasping arm 18 of an adjacent lever on each side of the shaft. The operating arm 17 of each lever 16 has its outer end supported or confined in an inwardly opening recess 19 provided therefor in the adjacent side wall of the housing 6. Each of the recesses 19 is formed by a pair of vertically spaced inwardly extending lugs 20 on the side wall of the housing 6; and the recess or pocket engaging ends of the arms 17 of the levers 16 are convexly curved to permit rocking or pivotal movement of said arms in said pockets. The housing 6 has inwardly extending flanges 21 along the lower edges of its side walls; and said flanges are notched, as at 22, to accommodate the billet gripping arms 18 of the levers 16 when said arms are swung outwardly to open the tongs formed thereby.

Located in the housing 6, just rearwardly of the floating shaft 11 therein, is a rock shaft 23 that extends longitudinally of said housing and is journaled in suitable bearings 24 provided therefor in said housing. The rock shaft 23 is provided at its forward end with a crank arm 25 that terminates at its outer end in a crank pin 26 that fits within an opening provided therefor in a radial extending arm 27 fixed to the adjacent rear end of the floating shaft 11, the arm 27 being preferably formed integral with the rearmost arm 13 on said floating shaft. The rock shaft 23 is rocked in its bearings 24 preferably

by means of a fluid cylinder 28 mounted on the top of the housing 6 and having a downwardly extending piston rod 29 pivotally connected at its lower end to an operating crank arm 30 fixed to the rear end of said shaft.

In operation, the carriage 4 of the charging machine is moved along the supporting tracks therefor to bring the tongs at the forward end of the housing or peel 6 over a billet 1 supported on the roller table 8 opposite the furnace opening 3. The housing 6 is then tilted to swing the forward end thereof downwardly and permit the tongs to grip said billet. The housing 6 is then tilted to lift the billet clear of the stop 8a at the delivery end of the roller table, and the carriage 4 is then moved forwardly to insert the forward end of the housing 6, together with the billet suspended therefrom, into the furnace 2 through the door 3 therein, after which the tongs are opened to release the billet 1 and deposit the same on the floor or hearth 29 of the furnace.

The billet gripping tongs are opened and closed by oscillating the rock shaft 26 in its bearings 24 in the housing 6. When the rock shaft 23 is oscillated in one direction, the floating shaft 11 is swung upwardly by the crank arm 25 of said rock shaft, the arms 13 fixed to the floating shaft rocking or pivoting in the supporting pockets 14 to accommodate the upward swinging movement of said floating shaft. During this upwardly swinging movement of the floating shaft 11, the ends of the operating arms 17 of the levers 16 journaled thereon are prevented from upward movement by the supporting pockets 19 therefor, whereby said levers are forced to pivot on the restrained ends of their operating arms and swing the billet gripping arms 18 of said levers outwardly to open the billet gripping tongs.

When the rock shaft 23 is turned in a direction which will swing the floating shaft 11 downwardly, the free ends of the arms 17 of the levers 16 pivot or rock in their supporting pockets 19 to accommodate such movement, and the billet gripping arms 18 of said levers are swung inwardly to close the tongs on the billet. If desired, the housing 6 may be equipped with several sets of tongs so as to permit the handling of a plurality of billets at one time. The rock shaft 23 is power operated preferably only to open the tongs, as the weight of the levers 16, the arms 13 and the floating shaft 11 is sufficient to provide the proper gripping action without power operation.

The hereinbefore described tongs mechanism has several important advantages. It is strong and durable and capable of operating at high temperatures; and it permits wear of the parts without interfering with the operation thereof. The parts are readily accessible and easily replaced; and no machined journals or bearings are required in the part of the housing or peel subject to the greatest heat. By the use of a double set of gripping tongs or by a greater spacing of the tongs on the floating shaft, the billet when gripped will be held substantially in a horizontal position.

Obviously, the hereinbefore described construction admits of considerable modification without departing from the invention. Therefore, I do not wish to be limited to the precise arrangement shown and described.

What I claim is:

1. Work gripping tongs comprising a substantially horizontally disposed shaft, having a laterally extending arm rigid therewith, two

levers journaled on said shaft, each of said levers having at one end an operating arm and at the opposite end a work gripping arm, said levers being arranged on said shaft with an operating arm of one lever and a work gripping arm of the other lever extending on one side of said shaft, a support having pockets on opposite sides of said shaft and opening in the direction thereof, one of said pockets pivotally supporting the outer end of the arm rigid with said shaft, and the other pockets pivotally supporting the outer ends of the operating arms of the respective levers, and means for raising and lowering said shaft relative to said support, whereby said levers are adapted to pivot in reverse directions on their pocket supported outer ends of their operating arms to cause said gripping arms to move away from each other when said shaft is raised and towards each other when said shaft is lowered.

2. Work gripping tongs comprising a downwardly opening housing, a substantially horizontally disposed shaft located in said housing, said shaft having laterally extending arms rigid therewith pivotally supported at their outer ends in said housing, a pair of levers journaled on said shaft, each of said levers having at one end an operating arm and at the opposite end a work grasping arm, said levers being arranged with an operating arm of one lever and a work grasping arm of the other lever on each side of said shaft and with the outer ends of the operating arms of the respective levers pivotally supported in said housing, and means for raising and lowering said shaft in said housing whereby the levers journaled thereon are forced to pivot on said housing at the free ends of their operating arms to swing said work grasping arms away from each other when said shaft is raised and towards each other when said shaft is lowered.

3. Work gripping tongs comprising a downwardly opening housing, a substantially horizontally disposed shaft located in said housing, said shaft having two laterally extending arms rigid therewith pivotally supported at their outer ends in said housing, said arms being spaced apart longitudinally of said shaft and extending on one side thereof, a pair of levers journaled on said shaft between said spaced arms, each of said levers having at one end an operating arm and at the opposite end a work grasping arm, said levers being arranged with an operating arm of one lever and a work grasping arm of the other lever on each side of said shaft and with the outer ends of the operating arms of the respective levers pivotally supported in said housing, and means for raising and lowering said shaft in said housing whereby the levers journaled thereon are forced to pivot on said housing at the free ends of their operating arms to swing said work grasping arms away from each other when said shaft is raised and towards each other when said shaft is lowered, said last mentioned means comprising an operating shaft journaled in said housing in end-to-end relation to said lever supporting shaft, and a crank connection between said shafts.

4. In a billet charging mechanism for a furnace, a downwardly opening housing movable horizontally into and out of said furnace, a substantially horizontally disposed floating shaft in said housing and extending in the direction of movement thereof, arms rigid with said shaft and extending laterally therefrom adjacent the ends thereof and pivotally supported at their outer ends in said housing, a pair of levers journaled

on said floating shaft, each of said levers having at one end an operating arm extending laterally from said floating shaft and at the opposite end a billet gripping arm extending below said housing, said levers being arranged with an operating arm of one lever and a billet gripping arm of the other lever on each side of said float-

5 ing shaft and with the outer ends of the operating arms of the respective levers pivotally supported in the adjacent sides of said housing, an operating shaft journaled in said housing in end to end relation to said floating shaft, and a crank connection between adjacent ends of said shafts.

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