No. 829,718. PATENTED AUG. 28, 1906.

C. W. A. KOELKEBECK.

BELL GEAR FOR BLAST FURNACES.

APPLICATION FILED OCT. 23, 1905.

3 SHEETS—SHEET 1.

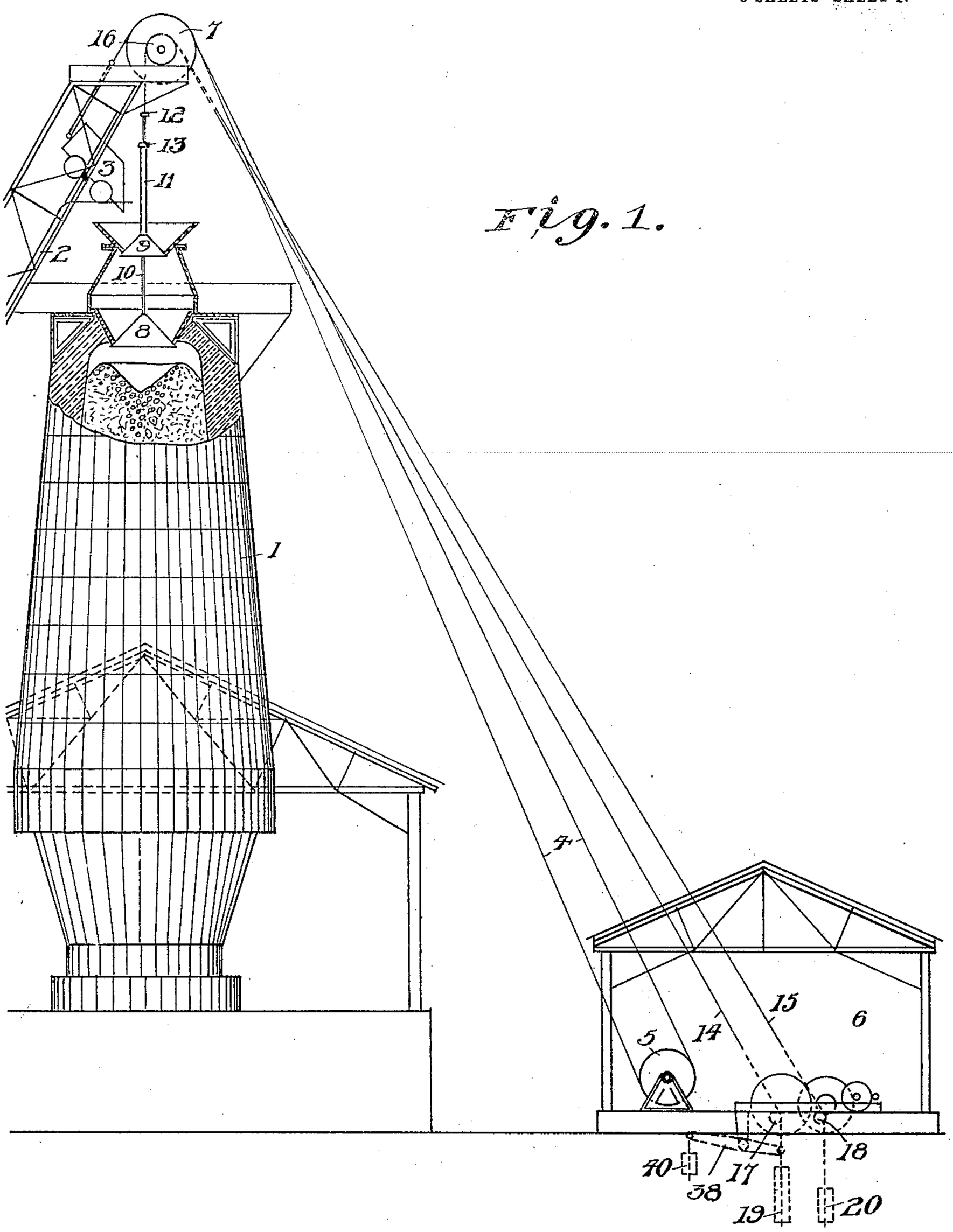

Fig. 1.

WITNESSES:

J. R. Coffeman,

O. D. Thompson

Carl W. A. Koelkebeck INVENTOR.

BY W. G. Doolittle

ATTORNEY.

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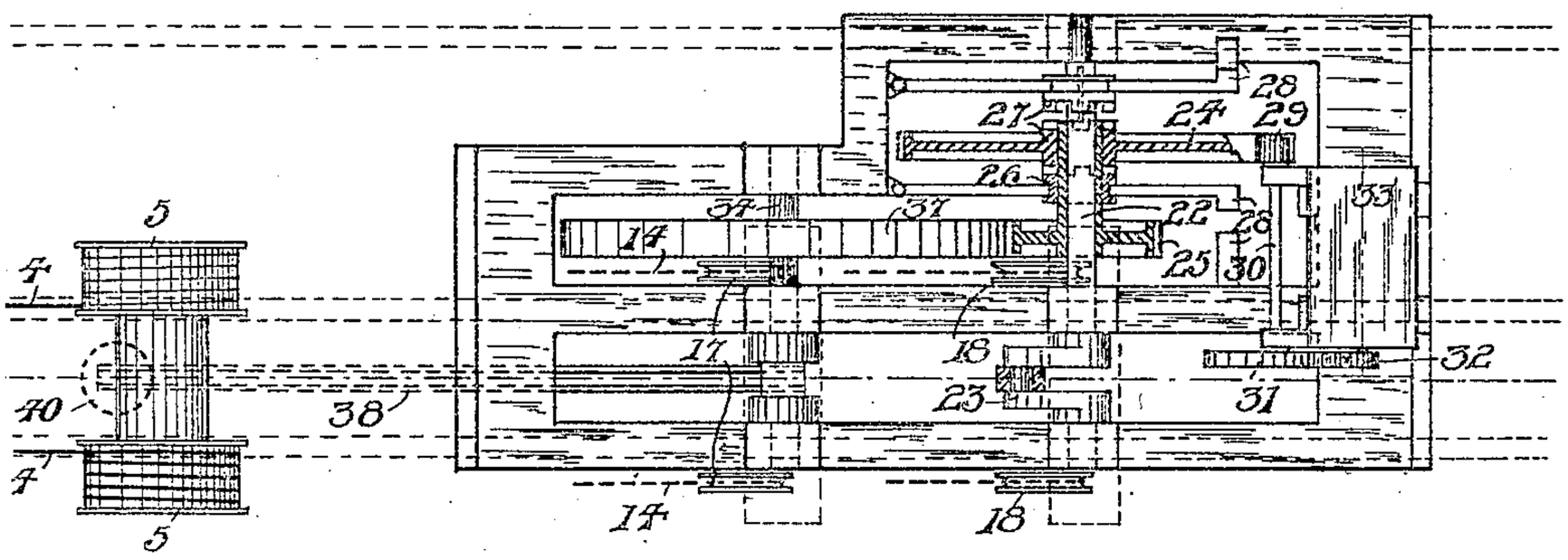

Fig. 2.

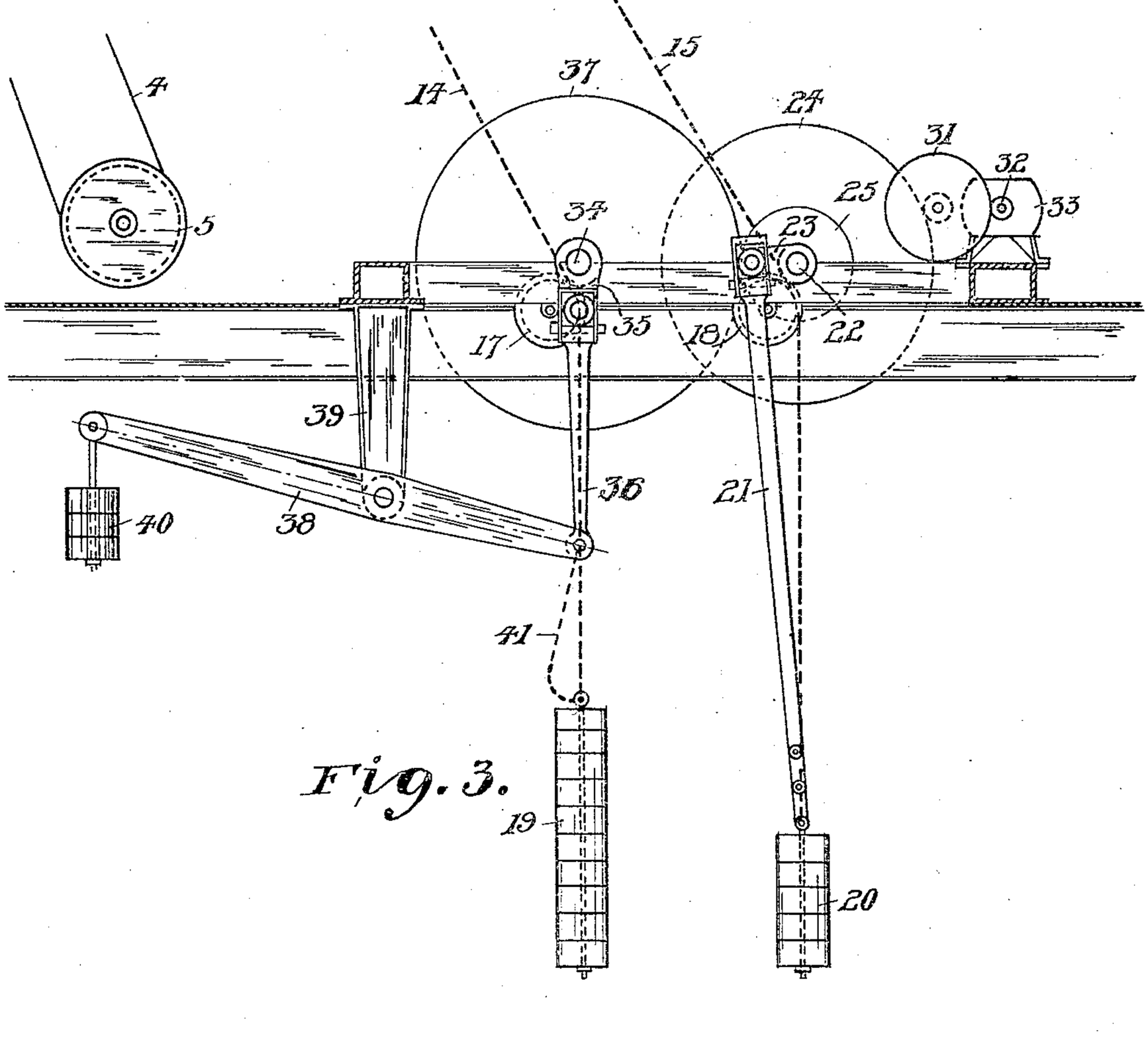

Fig. 3.

WITNESSES:

J. P. Hoffman,

O. D. Thompson

Carl W. A. Koelkebeck. INVENTOR.

BY W. G. Doolittle

ATTORNEY.

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3 SHEETS—SHEET 3.

FIG. 5.

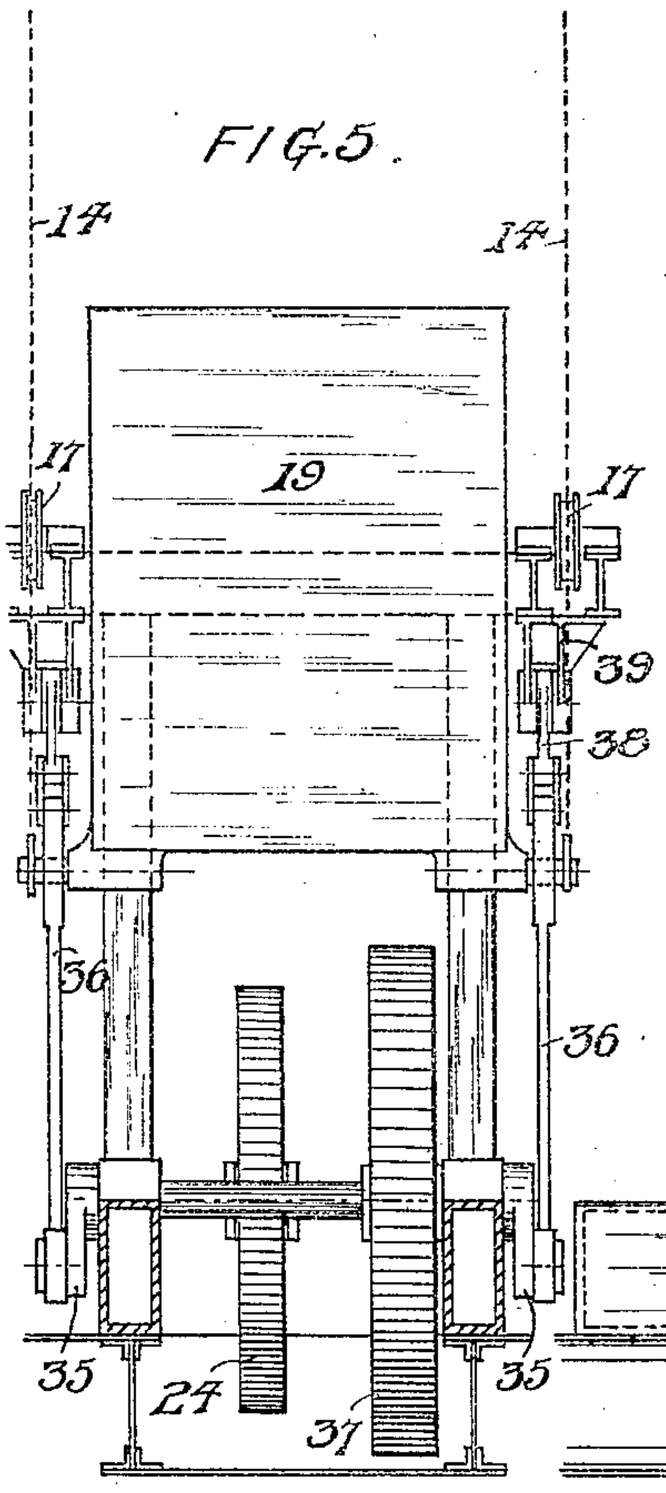


FIG. 4.

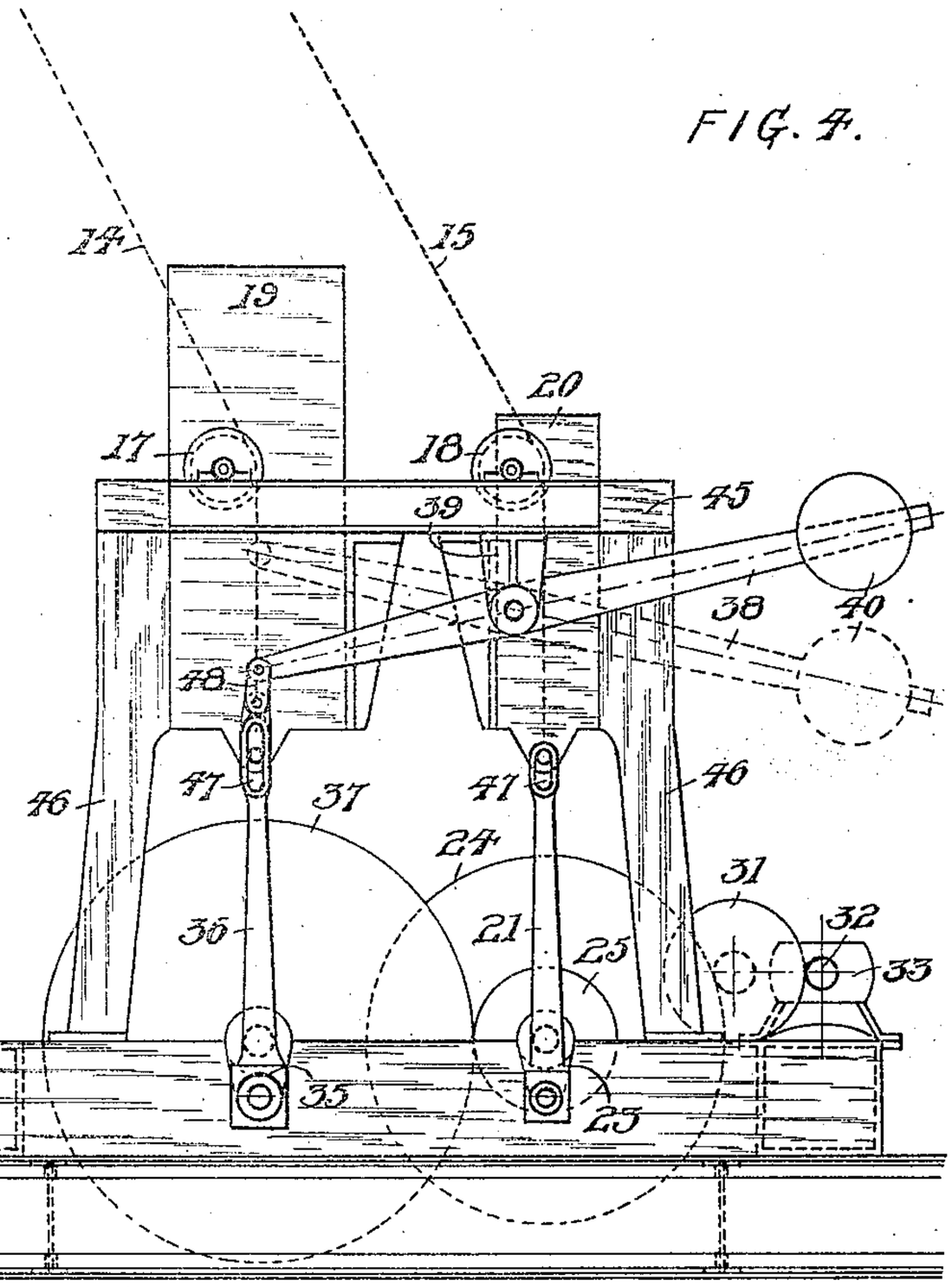
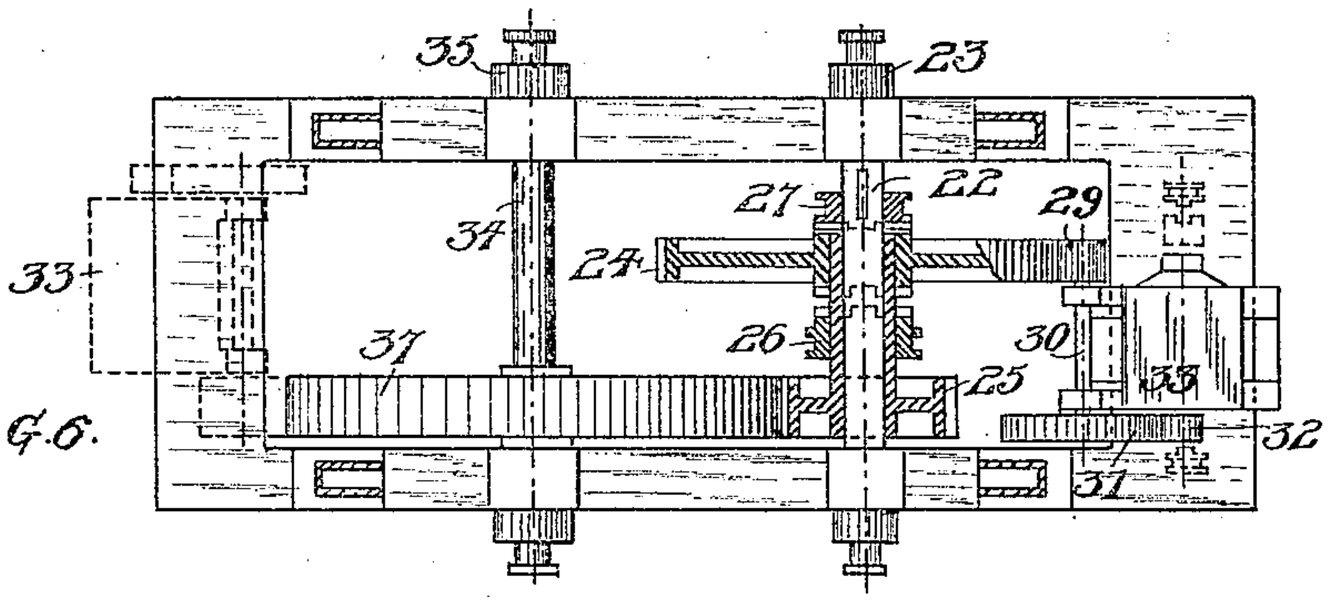


FIG. 6.



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O. D. Thompson

INVENTOR.

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BY W. G. Doolittle

ATTORNEY.

UNITED STATES PATENT OFFICE.

CARL W. A. KOELKEBECK, OF EAST CLEVELAND, OHIO.

BELL-GEAR FOR BLAST-FURNACES.

No. 829,718. Specification of Letters Patent. Patented Aug. 28, 1906.

Application filed October 23, 1905. Serial No. 284,003.

To all whom it may concern:

Be it known that I, CARL W. A. KOELKEBECK, a citizen of the United States, residing at East Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Bell-Gear for Blast-Furnaces, of which the following is a specification.

The object of my invention is to provide new and improved operating-gear for actuating the bells of blast-furnaces; and to this end my invention consists of new and improved bell-gear for blast-furnaces, in the novel features of construction, and in the combination and arrangement of parts, all as hereinafter described and claimed.

In the accompanying drawings, which illustrate applications of my invention, Figure 1 is a diagrammatical side elevational view showing a construction embodying my invention; Fig. 2, a part plan and a part sectional view of the operating-gear; Fig. 3 a side elevational view of said gear; Fig. 4, a side elevational view of a modified form; Fig. 5, an end view of the form of Fig. 4, and Fig. 6 a part plan and a part sectional view of the modified construction.

Referring to the drawings, 1 designates a blast-furnace of the well-known form, 2 the inclined bridge leading to its top, and 3 the skip-car. To the skip-car 3 is attached a cable 4, which extends from a winding-drum 5 of the hoisting mechanism, located in a motor-house 6, up to and over a sheave 7. In the drawings I have shown the motor-house located at the yard-level and on the opposite side of the furnace from the incline, and while it is preferably so located it may be otherwise situated. The furnace is provided with a lower main bell 8 and an upper bell 9, and the operating-rod 10 for the lower bell extends upwardly from said bell through a tubular rod 11 to a cross-head 12. Tubular rod 11 at its upper end is provided with a cross-head 13. Chains 14 and 15 are respectively connected with the two cross-heads 12 and 13 and extend upwardly therefrom over chain-wheels 16 16 and then downwardly to the motor-house over chain-wheels 17 and 18.

Referring now particularly to the form of Figs. 2 and 3, the operating-chains for the main bell are attached to a counterweight 19 and the operating-chains 15 for the upper bell to a counterweight 20. These counterweights are each heavier than their respective bells and charges and will therefore seat the bells and hold them seated until it is desired to dump the charges. Attached to the counterweight 20 of the upper bell is a connecting-rod 21, which is actuated to raise the weight 20 and to lower the upper bell by a gear mechanism comprising a shaft 22, crank 23, to which the connecting-rod is secured. Shaft 22 also carries a driven gear-wheel 24, a driving gear-wheel 25, which latter is formed with a sleeve, and two couplings 26 and 27, both arranged to be brought into engagement with the driven gear-wheel 24. Coupling member 26 slides on the sleeve of wheel 25 and member 27 is feathered to shaft 22 and slides thereon. In the drawings I have shown electromagnets 28 28 for sliding the coupling members into and out of engagement with the driven wheel; but these may be omitted and said members moved by other means. 29 designates a small driving-wheel carried on a counter-shaft 30, and 31 a driven wheel mounted on the opposite end of counter-shaft 30 and meshing with a small driving-wheel 32, carried on the shaft of a motor 33. The gear mechanism for the main bell is connected up with and actuated by the gear mechanism of the upper bell and comprises a shaft 34, crank 35, connecting-rod 36, and a large driven gear-wheel 37. Connecting-rod 36 extends downwardly from the crank 35 and is connected at its lower end with a weighted beam 38. Beam 38 is supported by hangers 39 and is provided with a weight 40. The function of this mechanism is to reduce the amount of power required in lifting the counterweight 19. The lower end of the connecting-rod 36 is connected to the weight 19 by a chain 41. This chain 41 when the main bell is seated is slack, as shown by Fig. 2. Another important function performed by the construction just described is that the counterweight 19 will be maintained in the desired position. As shown by the drawings, I utilize the crank-shaft of the gear for the upper bell to mount gearing thereon for the purpose of driving the crank-shaft of the lower or main bell and also mount on this said first shaft clutch members whereby both crank-shafts may be thrown into and out of operation. Attention is called to the fact that the gearing and parts are so arranged as to impart a much slower motion to the large counterweight and main bell than is given to the upper bell and its counterweight.

When it is desired to lower the upper bell

and dump the charge, coupling 27 is moved into engagement with driven gear-wheel 24 and shaft 22 is actuated by motor 33 and the intermediate mechanism. The movement of shaft 22 turns the crank 23, thus raising the counterweight 20 and allowing the weight of the charge on the bell to force it downward. The movement of crank 23 is so timed that in one revolution of the crank the stock will be discharged before the bell is again lifted to its seat by the counterweight. There is no direct connection between either bell and their respective actuating-cranks. The operation of lowering the main bell is accomplished by sliding coupling 26 into engagement with wheel 24. The movement of crank 35 and the shaft 34 of the main bell-gear is effected by utilizing the gear of the upper bell, as above referred to. The movement of crank 35 is slow at first, and as it rises connecting-rod 36 and weighted beam 38 are also raised and the chain 41 tightened. A continued movement of the crank 35, which movement becomes faster as the crank rises, lifts the counterweight 19 and permits the load of the charge to lower the bell. When the crank reaches its highest point, the stock has in the meantime been discharged and as soon as the crank has made one revolution its movement is stopped by an electric cut-out.

In the modified form of Fig. 4 I have shown the counterweights placed above the crank-shafts and guided by a frame 45, supported from the bed-plates by columns 46. The actuating mechanism of the upper bell comprises two cranks 23 and two connecting-rods 21, and the mechanism for the main bell in this form comprises two cranks 35 and two connecting-rods 36. Each of the connecting-rods is formed with a loop 47 at its upper end to engage with means on the weight. The weighted beams 38 are connected with the upper ends of connecting-rods 36 by means of links 48. In this construction the chain-wheels 17 and 18 are mounted above the bed-plate on the framework 45. The preferred operation of this modified construction is similar to the form of Fig. 2—that is to say, both mechanisms are operated by a single motor and the intermediate mechanism above described. If preferred, however, two motors may be employed. In Fig. 6 I have indicated a second motor 33 in dotted lines. In this same figure I have also shown that the coupling members may be placed on the motor-shaft.

What I claim is—

1. A furnace having a hopper and a bell, a counterweight arranged to hold the bell closed, a connection between the bell and counterweight, and mechanism for lifting the counterweight comprising a motor, a crank-shaft, a connecting-rod between the crank and counterweight, and a movable weighted beam secured to the connecting-rod and arranged to act in opposition to the counterweight.

2. A furnace having a hopper and a bell, a counterweight arranged to hold the bell closed, a connection between the bell and counterweight, and mechanism for lifting the counterweight comprising a motor, a crank-shaft, a connecting-rod between the crank and counterweight, a movable weighted beam secured to the connecting-rod, and means connecting the counterweight and connecting-rod.

3. A furnace having an upper and a lower bell, counterweights arranged to hold the bells closed, a connection between each bell and its counterweight, and mechanism for lifting the counterweights to lower the bells comprising a motor, a crank-shaft for lifting the counterweight of the upper bell, a crank-shaft for lifting the counterweight of the lower bell, and gearing mounted on the first crank-shaft for driving the second crank-shaft.

4. A furnace having an upper and a lower bell, counterweights arranged to hold the bells closed, a connection between each bell and its counterweight, and mechanism for lifting the counterweights to lower the bells, comprising a motor, a crank-shaft for the upper bell, a crank-shaft for the lower bell, gearing carried on the first shaft for operating the second shaft, and a clutch on the first shaft for throwing the second shaft into and out of operation.

5. A furnace having a hopper and a bell, a counterweight arranged to hold the bell closed, a connection between the bell and counterweight, a mechanism for lifting the counterweight to close the bell, comprising a crank-shaft, a motor, a counter-shaft between the motor and the crank-shaft, gearing on the crank-shaft and a clutch on the crank-shaft for throwing the crank-shaft into and out of operation.

6. A furnace having a hopper and a bell, a counterweight arranged to hold the bell closed, a connection between the bell and counterweight, and mechanism for lifting the counterweight comprising a motor, a crank-shaft, a connecting-rod formed with a loop portion at one end to engage the counterweight and joined to the crank at its other end, and a movable weighted beam attached to the connecting-rod and arranged to act in opposition to the counterweight.

7. A furnace having a hopper and a bell, a counterweight arranged to hold the bell closed, a connection between the bell and counterweight, mechanism for lifting the counterweight, comprising a motor, a crank-shaft, a connecting-rod formed with a loop portion at one end to engage the counterweight and joined to the crank at its other end, a movable weighted beam arranged to

act in opposition to the counterweight, and a link connection between the beam and the connecting-rod.

8. A furnace having an upper and a lower bell, counterweights arranged to hold the bell closed, a connection between each bell and counterweights, and mechanism for lifting the counterweights to lower the bells, comprising a motor mounted on a bed-plate located near the yard-level, a framework for guiding the counterweights, columns extending upwardly from the bed-plate and supporting the framework, a crank-shaft for the counterweight of the upper bell, a crank-shaft for the counterweight of the lower bell, and gearing between the motor and the crank-shafts.

9. A furnace having an upper and a lower bell, counterweights arrranged to hold the bells closed, a connection between the bells and counterweights, and mechanism for lifting the counterweights to lower the bells, comprising a motor mounted on a bed-plate located near the yard-level, a framework above the bed-plate for guiding the counterweights, crank-shafts for each bell, a connecting-rod joining each counterweight and crank-shaft, a movable weighted beam connected to the connecting-rod of the lower bell and supported above the bed-plate by the framework.

10. A furnace having an upper and a lower bell, counterweights arranged to hold the bells closed, a connection between each bell and its counterweight, and mechanism for lifting the counterweights to lower the bells comprising a motor, a motor-shaft, a crank-shaft for lifting the counterweight of the upper bell, a crank-shaft for lifting the counterweight of the lower bell, said shafts all arranged in parallel planes and spur-gearing interposed between the motor-shaft and crank-shafts.

11. A furnace having an upper and a lower bell, counterweights arranged to hold the bells closed, a connection between each bell and its counterweight, mechanism for lifting the counterweight of the lower bell comprising a crank-shaft, a connection between the crank and counterweight and a movable weighted beam secured to the connection and arranged to act in opposition to the counterweight, mechanism for lifting the counterweight of the upper bell comprising a crank-shaft, a connection between the crank and counterweight, a motor, a motor-shaft, said crank and motor-shafts all located in parallel planes, and spur-gearing interposed between the motor-shaft and the crank-shafts.

In testimony whereof I affix my signature in presence of two subscribing witnesses.

CARL W. A. KOELKEBECK.

Witnesses:

M. A. DAWSON,

HARRY SUSSER