(No Model.) 2 Sheets—Sheet 1.

A. KITSON.

AUTOMATIC FUEL CHARGING APPARATUS.

No. 594,538. Patented Nov. 30, 1897.

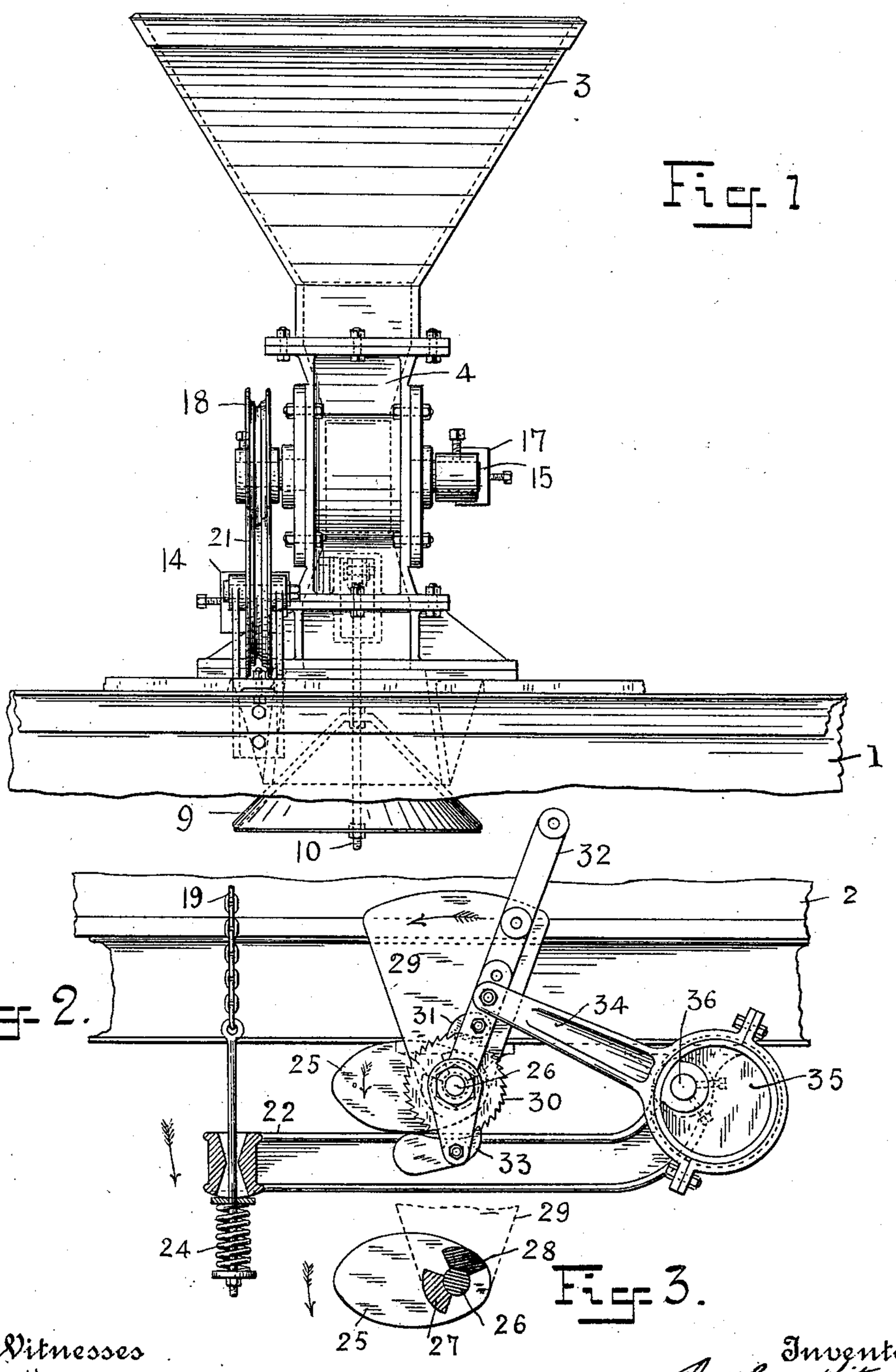

Fig. 1

Fig. 2.

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4

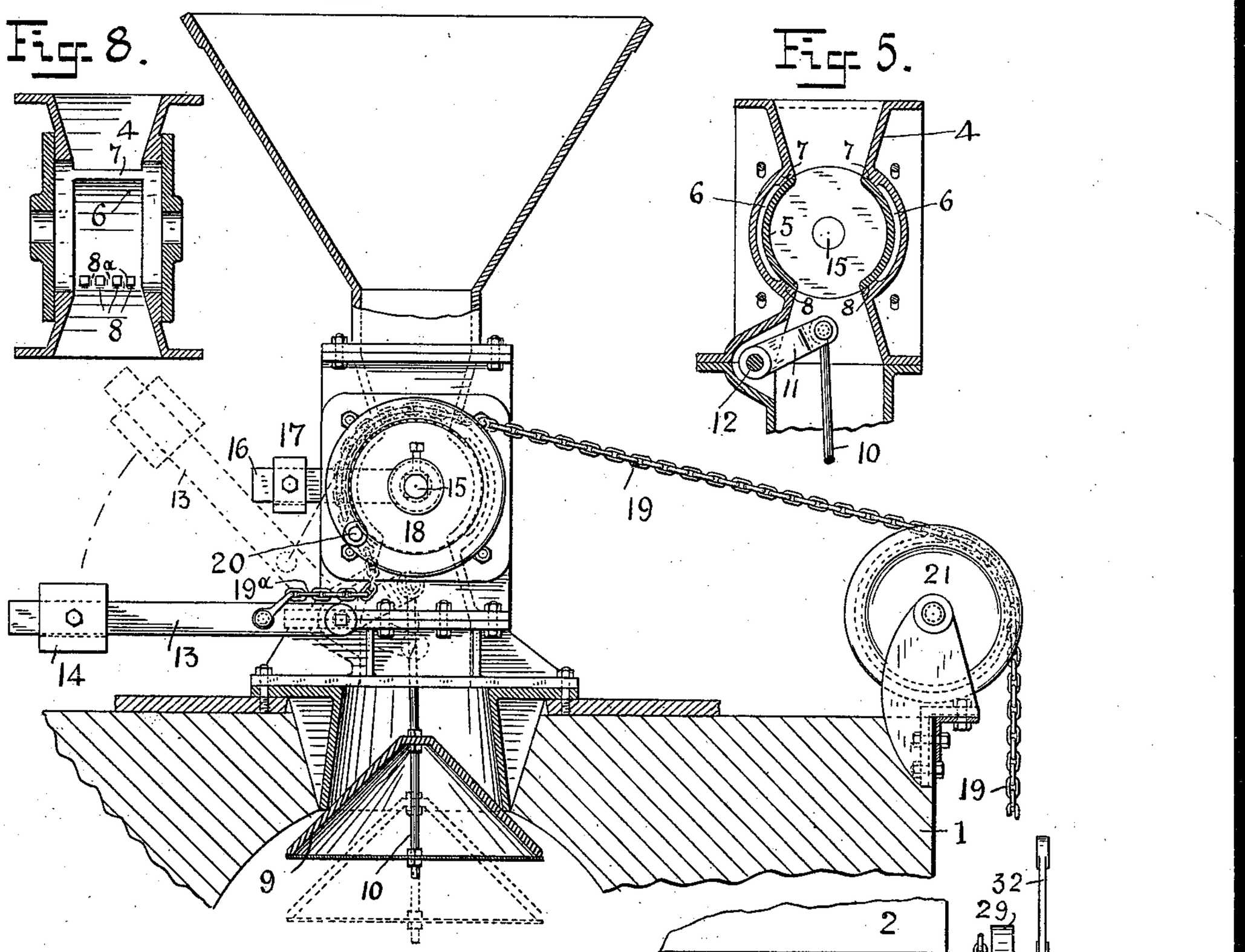


Fig. 8.

Fig. 5.

Fig. 6.

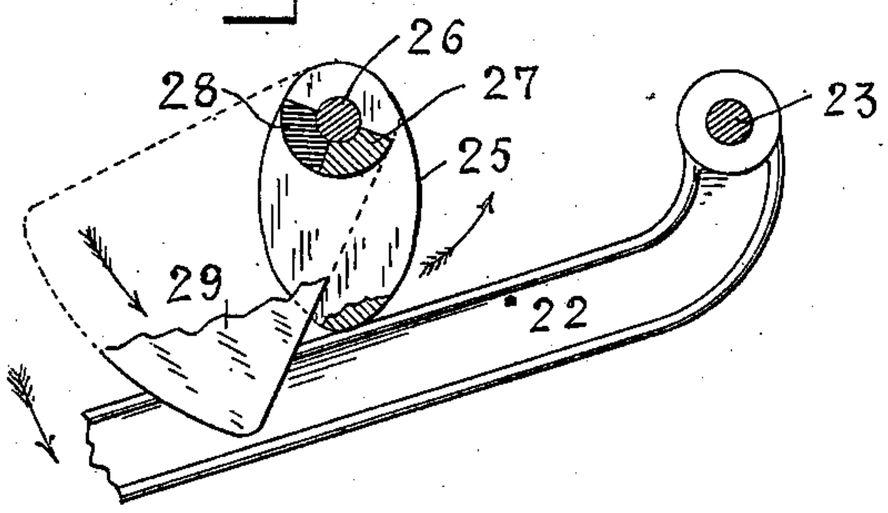
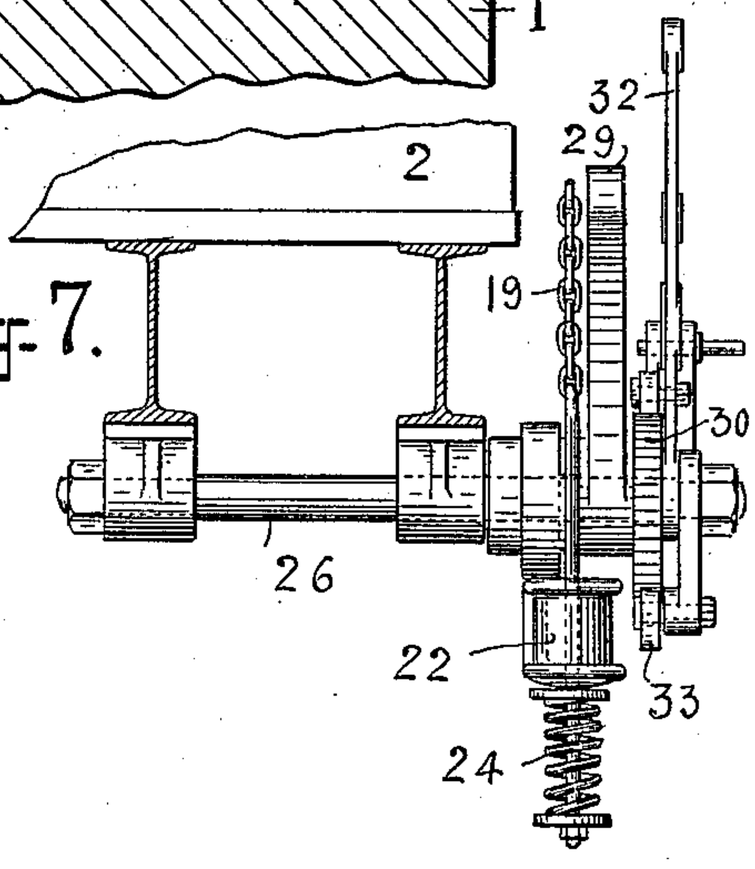


Fig. 7.



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UNITED STATES PATENT OFFICE.

ARTHUR KITSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO APPLETON L. CLARK.

AUTOMATIC FUEL-CHARGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 594,538, dated November 30, 1897.

Application filed May 10, 1897. Serial No. 635,947. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR KITSON, a subject of the Queen of Great Britain, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Fuel-Charging Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists of an improved automatic charging apparatus for charging predetermined amounts of fuel to a gas-producer or other furnace at regular intervals. Such a charging apparatus must be quick in its action and positive. It must not permit any of the gases to escape during the operation, and must not be liable to clog or become jammed so that it will fail to operate. My invention secures all these necessary qualifications, and the preferred form of apparatus embodying said invention is illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is an end elevation of a charging-hopper and controlling apparatus in the throat thereof with a portion of the top platform of the furnace. Fig. 2 is a side elevation and partial section of the actuating-lever with the coöperating parts mounted on the base of the furnace, a portion of which is shown. Fig. 3 is a diagrammatic view, partly in section, showing the connection between the falling weight and the cam. Fig. 4 is a side elevation and partial section of the parts shown in Fig. 1. Fig. 5 is a detailed section of the valve in the throat of the hopper. Fig. 6 is a detailed view, broken away in part, showing the cam operating on the actuating-lever. Fig. 7 is an end elevation of the apparatus shown in Fig. 2. Fig. 8 is a detailed view showing the lower bearing-surface for the valve in the throat of the hopper scored so as to permit the material trapped in the cored-out portion of the valve-casing to escape.

Throughout the drawings like reference-figures refer to like parts.

1 represents a portion of the top of the furnace or gas-producer. 2 is a portion of the foundation thereof.

3 is the feed-hopper. 4 is the throat of said feed-hopper, in which is located the valve 5 or other apparatus controlling the passage through said throat.

6 represents a cored-out portion of the valve-casing on either side of the valve, which leaves only narrow portions 7 7 at the upper intersection of the valve-casing and the throat and similar portions 8 8 at the lower intersection of said valve-casing and throat as bearings for the valve 5. The lower bearing-surfaces 8 8 are scored at 8^a, as shown in Fig. 8, so as to afford an outlet for the closed space formed by the cored-out portions 6.

9 is the ordinary charging-bell, supported on the vertical rod 10, which may be hung from the crank 11 on the bell-crank shaft 12. This shaft has an external lever-arm 13, on which is the adjustable counterweight 14.

15 represents the shaft on which the valve 5 is mounted, and 16 is a lever-arm connected thereto, carrying the counterweight 17.

18 is a grooved pulley-wheel also mounted on the shaft 15 of the valve, around which the chain 19 runs, being pinned to said pulley-wheel at the point 20. A further portion of said chain 19 (marked 19^a) extends to the counterweight-lever 13.

21 is a guide-pulley for chain 19, mounted on the edge of the furnace-top.

The downwardly-extending portion of chain 19 is connected to the actuating-lever 22, which is pivoted on the shaft 23, which shaft is journaled on the foundation 2 of the furnace. The connection of the chain 19 to the lever 22 may be of any kind, but I prefer to make it an elastic connection by means of the spring 24, as shown in Figs. 2 and 7. The actuating-lever 22 is driven by means of the cam 25, which is loosely mounted on the stud 26 and has a finger 27, which projects in line with a similar finger 28, mounted on the weight 29, which also revolves on the stud 26. I prefer to make the fingers 27 and 28 of such angular shape that the weight and cam have one hundred and eighty degrees of free motion with

reference one to the other, but less amount than that would suffice for the purpose of this portion of this apparatus.

30 represents a ratchet-wheel which revolves on the stud 26, but is fast to the weight 29, so that the two revolve together. This ratchet-wheel has the driving-pawl 31 on the oscillating lever 32 and the check-pawl 33, mounted on a rigid downward projection from the stud 26.

34 is an eccentric rod and strap which may be pivoted to the oscillating lever 32 at various points, as shown, so as to give varying amplitude and speed of motion to the lever 32. 35 is an eccentric driving said eccentric-rod, mounted on the slowly but continuously moving shaft 36, which may be driven by any kind of suitable gearing. (Not shown.)

The mode of operation of my invention is as follows: The feed-hopper 3 is filled with pulverized fuel either by hand or by any form of conveyer. (Not shown.) The shaft 36 revolves slowly at a fixed velocity, the power being supplied from any suitable connection, which forms no part of the invention. The rotation of the eccentric 35 gives an oscillating motion to the lever 32, which is variable within quite wide limits by means of the adjustable connection shown. The motion of the lever 32 to the left (looking at Fig. 2) is communicated to the ratchet-wheel 30 by means of the driving-pawl 31. During the backward motion of the driving-pawl 31 the checking-pawl 32 prevents backward motion of the ratchet-wheel 30. When the weight 29 has been driven by this action of the pawl and ratchet a slight distance beyond the position shown in Figs. 2 and 3, it falls by its own weight. After traveling a sufficient distance to accumulate momentum the finger 28 on said weight comes in contact with the finger 27 on the cam 25, driving said cam downward with great force. The cam in turn forces down the actuating-lever 22, which pulls on the chain 19. This pull rotates the pulley-wheel 18 and valve 5 until the passage-way through the throat 4 of the feed-hopper is closed. This motion is just sufficient to take up the normally slack portion 19^a of the extended chain. Further motion of the chain and rotation of the valve cause the counterweight-lever 13 to be pulled up into the position shown in dotted lines in Fig. 4, which rotates the bell-crank shaft 12 and lowers the bell-crank 11, rod 10, and charging-bell 9. It is evident that the closing of the valve 5 leaves a predetermined amount of pulverized fuel below it and above the charging-bell 9 and that after such closing of the valve the dropping of the charging-bell 9 will discharge said quantity of fuel into the combustion-chamber of the furnace and that the closure of the valve will prevent any escape of gases during said lowering of the bell 9. The weight 29 will fall through one hundred and eighty degrees of revolution, and this will be sufficient to carry the cam 25 to the right hand of the vertical position shown in Fig. 6 and to the right hand of a line drawn from the stud 26 perpendicular to the actuating-lever 22. Consequently the upward pull on chain 19, produced by the counterweights 14 and 17, will tend to raise said lever 22 after the weight falls, the cam 25 being free to move away from the weight by the necessary fraction of a revolution. The rising of the actuating-lever 22 permits chain 19 to rise with it and counterweights 17 and 14 to fall. This will reverse the motion of the valve 5 and lift the charging-bell 9 back into position. Further motion of the counterweight 17 will open valve 5 and leave the portion 19^a of the chain slack, and the apparatus is ready for a repetition of the above-described operation when the slow motion of the pawl-and-ratchet gear shall have raised the weight 29 through one hundred and eighty degrees back to the position shown in Fig. 2.

The coring out of the casing of the valve 5 is important, because leaving narrow bearing-surfaces 7 7 it secures a tighter bearing and smoother fitting of the parts and prevents the escape of gas at the same time that it reduces the friction of the valve in turning. There will be a tendency for some of the contents of the valve to lodge in this cored-out portion 6 of the valve-casing, and to free them I have scored the lower bearing-surfaces 8 vertically, as shown at 8^a in Fig. 8, so that while the valve is closed the lodged particles can run through the channels thus provided and prevent packing of the material in the cored-out portions. When the valve is open again and the material rushes in from the feed-hopper, of course such freeing action will be checked, but all that is necessary is to allow a portion to escape, so that the material will not become jammed between the surfaces.

It is evident that various changes could be made in the details of my apparatus without departing from the spirit of the invention.

A different form of valve might be used. A different form of loose connection between the valve and the charging-bell lever might be substituted. Other forms of connection from the actuating-lever to the controlling apparatus in the throat of the feed-hopper might be employed and another form of controlling apparatus altogether might be substituted. The particular form of loose connection between the weight and cam might be varied and the organization of the pawl-and-ratchet driving-gear changed so long as a slow rotation of the weight were produced and it is left free to fall and to give the cam the motions above described.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In an automatic fuel-charging apparatus the combination of the hopper, the intermittently-oscillating valve, the charging-bell, and counterweight therefor, with connecting

mechanism which transmits a portion of the motion of the valve to the charging-bell, substantially as described.

2. In an automatic fuel-charging apparatus the combination of the hopper, the intermittently-oscillating valve, the charging-bell, and counterweight therefor, with the chain which transmits motion to the valve, and to the counterweight, that portion of the chain between valve and counterweight being normally slack, substantially as described.

3. In a fuel-charging apparatus the combination of the hopper and the valve located in the throat of said hopper, the casing of said valve being cored out so as to leave bearing-surfaces for the valve only adjacent to the intersection of the throat and the valve-casing, substantially as described.

4. In a fuel-charging apparatus the combination of the hopper and the valve located in the throat of said hopper, the casing of said valve being cored out so as to leave bearing-surfaces for the valve only adjacent to the intersection of the throat and the valve-casing, and the lower pair of said bearings being scored vertically to discharge the material collected in said cored-out portions, substantially as described.

5. In an automatic fuel-charging apparatus the combination with the hopper and controlling apparatus located in the throat thereof, of the revolving weight, means for communicating the falling motion of said weight to said controlling apparatus, and means for revolving the weight in a vertical plane, substantially as described.

6. In an automatic fuel-charging apparatus the combination with the hopper and controlling apparatus located in the throat thereof, of the revolving weight mounted on a horizontal shaft, the ratchet-wheel mounted on said shaft, driving and checking pawls for said ratchet-wheel, and means for communicating the falling motion of the weight to the controlling apparatus, substantially as described.

7. In an automatic fuel-charging apparatus the combination with the hopper and controlling apparatus located in the throat thereof, of the revolving weight mounted on a horizontal shaft, the ratchet-wheel mounted on said shaft, driving and checking pawls for said ratchet-wheel, and means for communicating the falling motion of the weight to the controlling apparatus, together with a variable-speed gear for the driving-pawl, substantially as described.

8. An apparatus for producing intermittent motion, which consists of the actuating-lever, connecting mechanism which normally lifts said lever, the continuously-rotated horizontal shaft, and the weight mounted thereon, the loose cam mounted on said shaft, and bearing on the lever, and the connection between weight and cam, which permits one to make a partial rotation independent of the other, substantially as described.

9. An apparatus for producing intermittent motion, which consists of the actuating-lever, elastic connecting mechanism which normally lifts said lever, the continuously-rotated horizontal shaft, and the weight mounted thereon, the loose cam mounted on said shaft and bearing on the lever, and the connection between weight and cam, which permits one to make a partial rotation independent of the other, substantially as described.

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

ARTHUR KITSON.

Witnesses:
GEO. OAT SUDDARDS,
A. ERNEST KITSON.