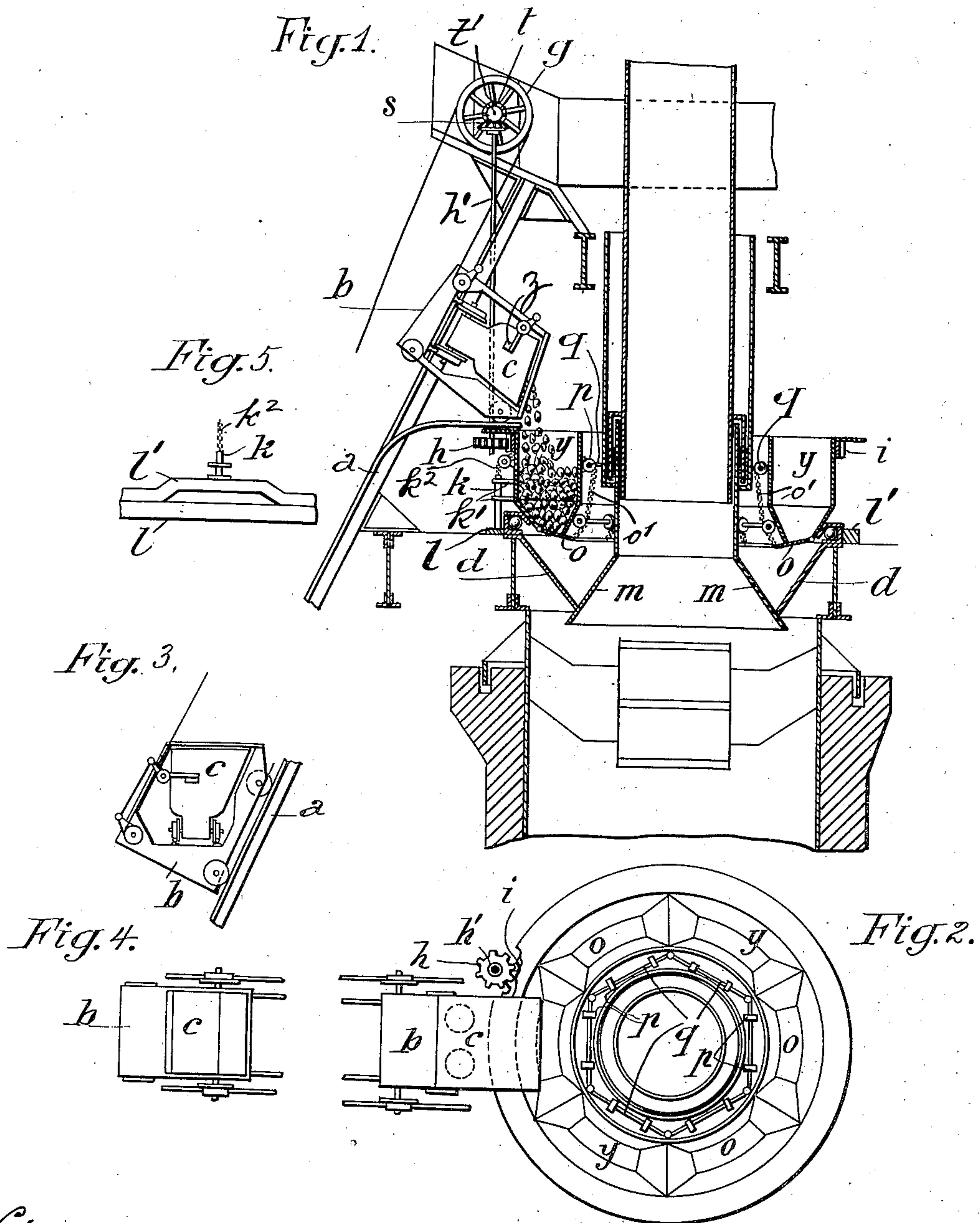


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APPLICATION FILED JULY 10, 1905.

938,572.

Patented Nov. 2, 1909.  
2 SHEETS—SHEET 1.



Witnesses:

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Inventor:

Léon Geuze.

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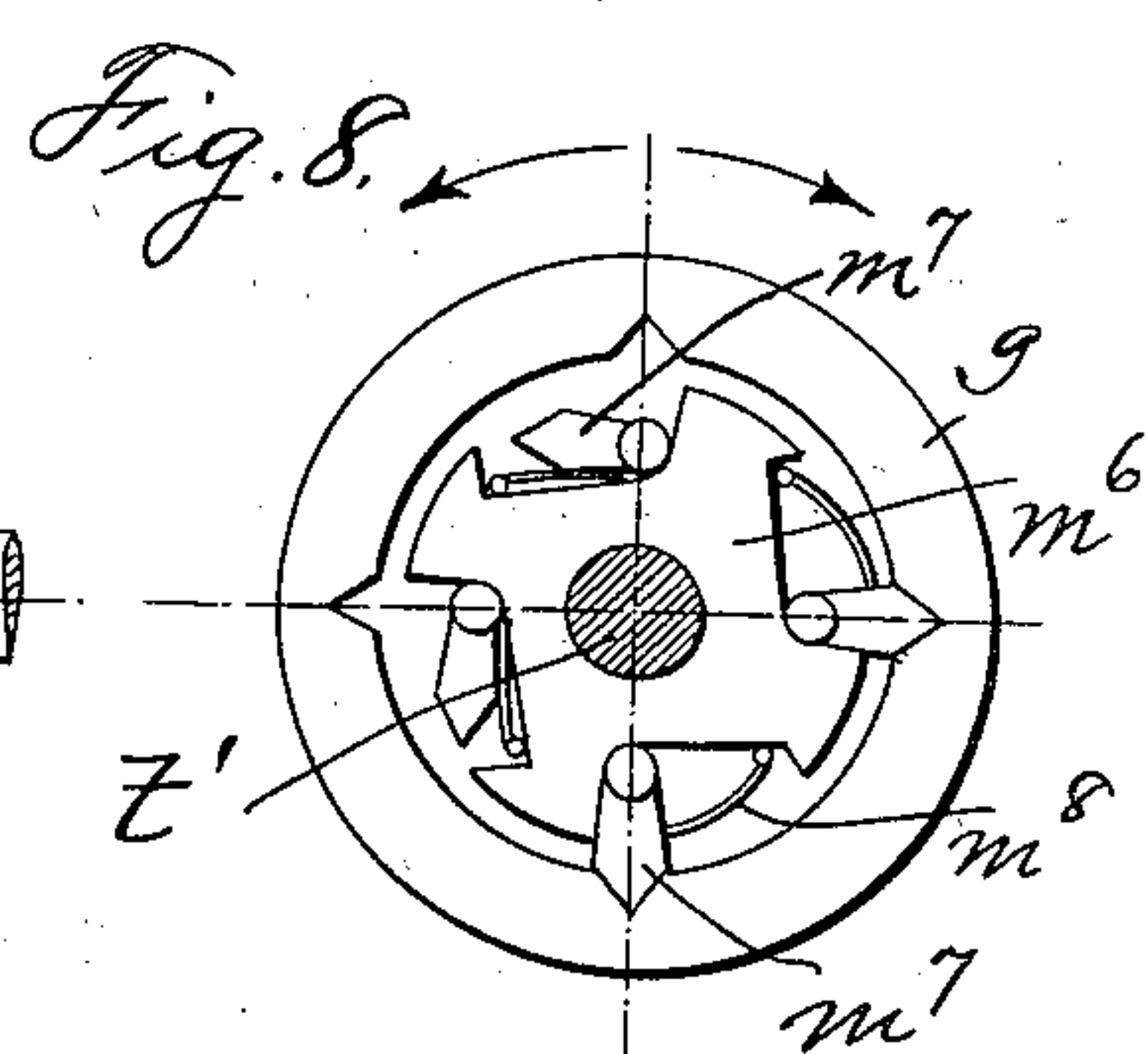
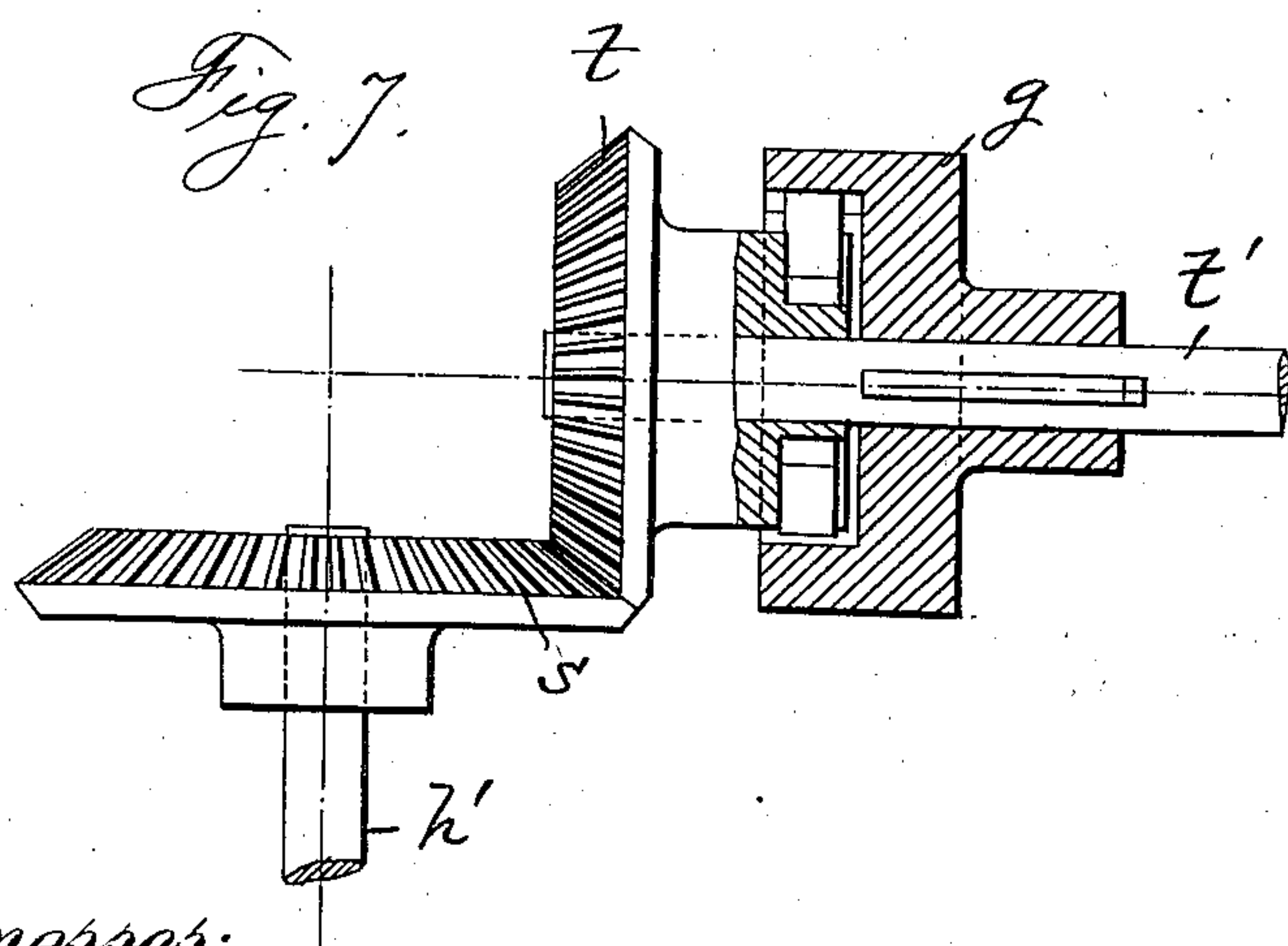
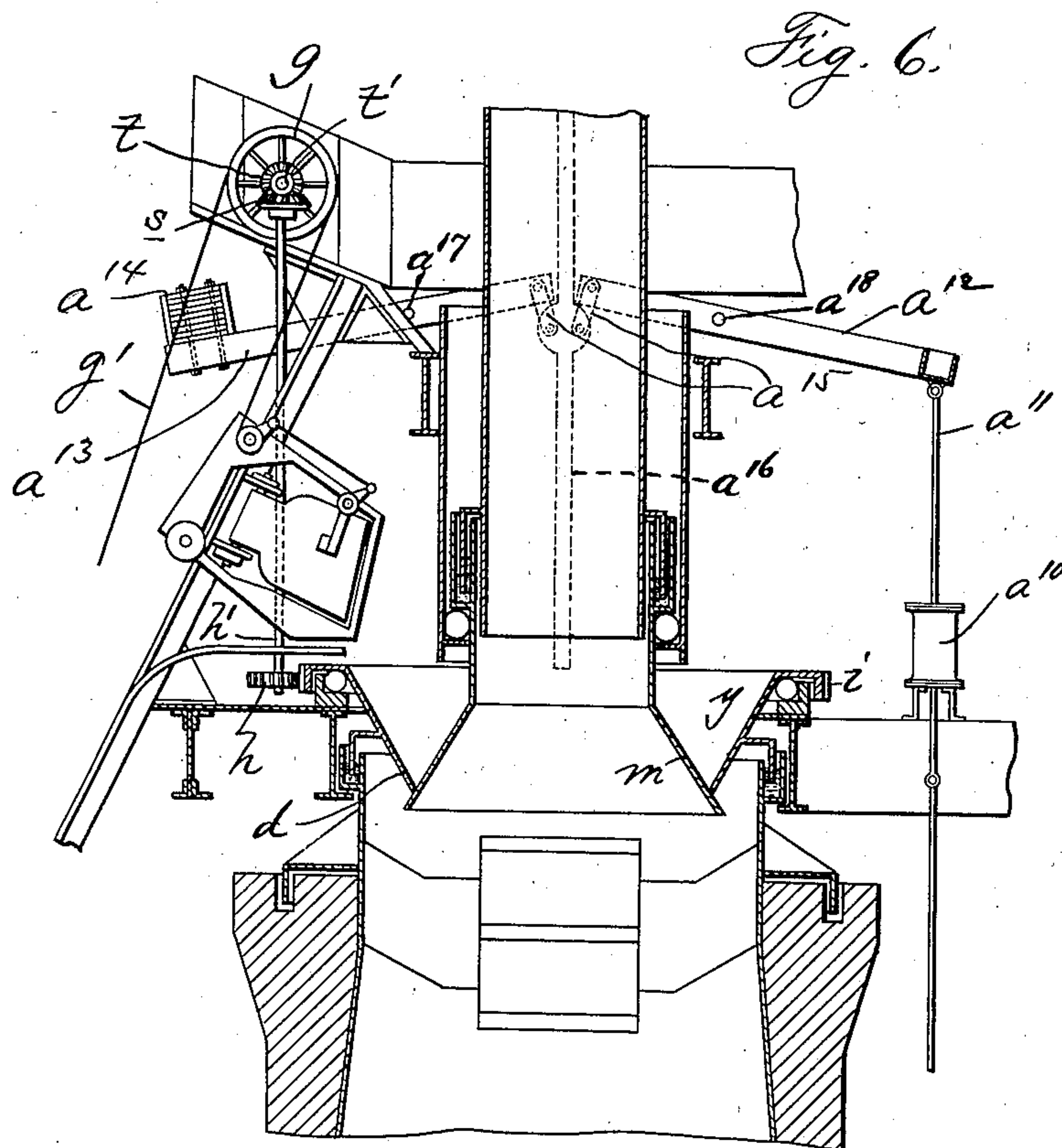
Attorney

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Witnesses:  
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# UNITED STATES PATENT OFFICE.

LÉON GEUZE, OF TRITH ST. LÉGER, FRANCE.

MECHANICAL CHARGING APPARATUS FOR BLAST-FURNACES.

938,572.

Specification of Letters Patent.

Patented Nov. 2, 1909.

Application filed July 10, 1905. Serial No. 269,078.

*To all whom it may concern:*

Be it known that I, LÉON GEUZE, a citizen of the French Republic, and resident of Trith St. Léger, Nord, France, have invented certain new and useful Improvements in Mechanical Charging Apparatuses for Blast-Furnaces, of which the following is a specification.

This invention relates to an improved construction of mechanical charging apparatus for blast furnaces.

It has mainly for its object to reduce the height of fall to which the materials constituting the charges of blast furnaces are subjected in mechanically charging apparatus of present construction, and whereby in particular the coke is subjected to considerable losses and deterioration by fracture and conversion into dust.

According to my improved apparatus the fall at the foot of the furnace is entirely done away with as the trucks containing the materials are not discharged into the receptacles by which they are raised to the top of the furnace, but the trucks are brought bodily on to a hoisting carriage which is tipped with the truck when it arrives at the furnace mouth. Furthermore, by effecting a step by step rotation of a hopper situated in the furnace mouth while successive trucks are discharged into it, a more uniform distribution of the charges in the furnace is insured.

I will proceed to describe the construction of my improved apparatus with reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the upper portion of a blast furnace embodying my invention. Fig. 2 is a plan view. Fig. 3 is an elevation of the hoisting carriage. Fig. 4 is a plan view of Fig. 3. Fig. 5 is a detail view hereinafter referred to. Fig. 6 is a sectional elevation showing a means for raising and lowering the cone. Figs. 7 and 8 are detail views hereinafter referred to, both views being partly in elevation and partly in section.

In the drawings, *a* indicates an inclined support upon which are arranged two lines of rails of different gages on which ascends and descends the hoisting carriage *b*.

The internal line of rails is bent at the upper end so as to assume a horizontal or slightly inclined position. Into the carriage *b* is introduced the truck *c* containing the ore, fluxes, etc., to be charged. This truck is supported by the carriage *b* to which it is

temporarily attached by any suitable means so as to prevent all displacement during the ascending and descending movements.

The lower end of hopper *d* is adapted to be closed by a cone *m*, which is adapted to be raised and lowered by any suitable means.

The trucks are emptied into a special hopper *y* having a number of compartments, each of which is provided at its lower part with a door or bottom *o*, the movement of which may be obtained in different ways, either automatically or by hand. I show an arrangement which allows of an automatic movement and thus not requiring any intervention on the part of the workman. The doors *o* are connected to chains *o'* secured to pulleys *p* mounted on shafts *q*, which are coupled together by universal joints, and the doors are all actuated simultaneously by a vertical rod *k* which is carried by the hopper *y* but can move vertically in guides *k'* carried by the hopper *y*. The rod *k* moves with the hopper *y* around the axis of the furnace and its lower end rides upon a circular track *l* which at a point in its surface is provided with a raised or cam portion *l'* seen more plainly in Fig. 5, which causes the rod *k* to rise as the lower end of the latter passes over said raised portion, and after passing over said raised portion the rod *k* will of course again descend.

The upper end of rod *k* is connected to a chain *k<sup>2</sup>* which transforms its vertical motion into a rotary motion of the pulleys *p* and thus operating the doors *l*. When the rod *k* rises the doors open and all the compartments of the hopper *y* discharge their contents into the annular space between the hopper *d* and cone *m* and the parts are so operated that when all the compartments have received their charge of coke the doors *o* would be opened to discharge their contents, and the same action is effected for the ore and when the coke and ore have descended into the space between parts *d* and *m*, the cone *m* is lowered to allow said coke and ore to fall into the furnace. When the rod *k* descends it closes all the doors *o* and keeps them in this condition during a complete revolution, less the extent of the raised portion *l'*.

The hopper *y* is adapted to turn upon ball bearings *y'*, and said hopper is adapted to be turned intermittently by the following means:—*i* is a toothed ring secured to hopper *y* exteriorly of same and adjacent to its



upper end and with which ring meshes a pinion  $h$  mounted on the lower end of a shaft  $h'$  suitably supported. Upon the upper end of the shaft is mounted a bevel pinion  $s$ , with which meshes a bevel pinion  $t$  mounted on a shaft  $t'$  carrying a pulley  $g$  over which passes a cable  $g'$  connecting the motor with the carriage  $b$ . The bevel wheel  $t$  has a pawl and ratchet connection (as  $m^6$ ,  $m^7$ ,  $m^8$  Fig. 8) with the shaft  $t'$  so as only to revolve during the descent of the hoisting carriage  $b$  so that the hopper only rotates during the said descent. The extent of each partial rotation depends upon the number of trucks that are required to be discharged into the space between hopper  $d$  and cone  $m$  for forming on the one hand the charge of coke and on the other hand the charge of ore.

The number of trucks of coke is generally equal to that of the ore and flux and if this number is  $=n$  for the coke as well as for the ore, the rotation of the hopper  $y$  is  $-$  of the circumference.

In operation, the carriage  $b$  being at the bottom of its course the truck  $c$  charged with coke or ore, is introduced into it and secured in place by a suitable catch such as  $z$ . The cable in exerting its traction causes the hauling carriage  $b$  to rise, and this toward the upper end of its course changes its position. The front wheels roll upon the curved part of the set of narrow gage, while the back wheels continue to run upon the straight set of wider gage rails. Under these conditions, the carriage  $b$  with the truck  $c$  assumes the inclined position shown in Fig. 1 and discharges its contents into the hopper  $y$ .

In reversing the motion of the motor, which actuates the cable of the carriage, the latter descends the inclined plane with the empty truck by gravitation. During the descent the hopper  $y$  turns through a certain distance for receiving the contents of a fresh truck at the side of the first one until the entire charge is completed, this being effected by a complete revolution of the hopper. When all the compartments of the hopper have received their charge of coke, all the doors  $o$  are opened and the coke falls into the space between  $d$  and  $m$ . The same action is effected for the ore, and when the coke and the ore have descended into the annular space between  $d$  and  $m$ , the cone  $m$  is lowered.

In Fig. 6 I show a means for raising and lowering the cone  $m$ .  $a^{10}$  indicates a steam or air compressor cylinder, the piston rod  $a^{11}$  of which is pivoted at  $a^{18}$  and is pivotally connected with one end of a lever  $a^{12}$  and whose opposite end is jointed by a link  $a^{15}$  with a rod  $a^{16}$  carried by the cone  $m$ . A lever  $a^{13}$  is also pivoted at  $a^{17}$  and is pivotally connected by second link  $a^{15}$  with the rod  $a^{16}$ , the outer end of the lever  $a^{13}$  carrying a weight  $a^{14}$ . Upward movement of piston

rod  $a^{11}$  will cause the cone  $m$  to be lowered, while the weight  $a^{14}$  will cause the cone  $m$  to be raised again.

The advantages of this system consist in the reduction of the number and the height of the fall of the materials to be introduced into the blast furnace. For the coke, in particular, the considerable falls produce fractures and pulverization which cause considerable losses of the combustible, and produce derangements in the working of the blast furnace. This is what takes place with the mechanical charging apparatus heretofore known. The height of fall between the base and the top of the furnace amounts in this apparatus to from 8 to 9 meters and is very detrimental to the proper utilization of the coke, which constitutes the most important element of the working expenses.

In the arrangement described above, the fall to the bottom of the furnace is entirely done away with and the fall at the upper end is reduced to its minimum.

The invention can be applied as well to blast furnaces with central gas discharge, as to furnaces with lateral gas discharge, while the existing arrangements for mechanical charge are only applicable to blast furnaces with lateral gas escapes.

Having now fully described my said invention, what I claim and desire to secure by Letters Patent is:

1. In an apparatus of the character described, the combination with a fixed hopper, and a cone movable relatively to said hopper and adapted to close the discharge opening thereof, of a rotatable hopper provided with a plurality of compartments, movable bottoms for said compartments, and means for operating said bottoms to permit the contents of said compartments to be discharged into the fixed hopper.

2. In an apparatus of the character described, the combination with a fixed hopper, and a cone movable relatively thereto and adapted to close the discharge opening of said hopper, of a rotatable hopper provided with a plurality of compartments, movable bottoms for said compartments, means for operating said bottoms to permit the contents of said compartments to be discharged into the fixed hopper, and means for imparting intermittent rotation to the rotatable hopper.

3. In an apparatus of the character described, the combination with a fixed hopper, and a cone movable relatively thereto and adapted to close the discharge opening of said hopper, of a rotatable hopper provided with a plurality of compartments, movable bottoms for said compartments, means for operating said bottoms to permit the contents of said compartments to be discharged into the fixed hopper, means for imparting intermittent rotation to the rotatable



ble hopper, a traveling carriage and a truck carried thereby adapted to be tilted to discharge its contents into the rotatable hopper.

4. In an apparatus of the character described, the combination with a fixed hopper, and a cone movable relatively thereto and adapted to close the discharge opening of said hopper, of a rotatable hopper provided with a plurality of compartments, 10 movable bottoms for said compartments, means for operating said bottoms to permit the contents of said compartments to be discharged into the fixed hopper, a traveling carriage, a truck carried thereby and 15 means for automatically tilting the truck at a predetermined point in the movement of the carriage.

5. In an apparatus of the character described, the combination with a fixed hop-

per, and a cone movable relatively thereto 20 and adapted to close the discharge opening of said hopper, of a rotatable hopper provided with a plurality of compartments, movable bottoms for said compartments, and means for operating said bottoms com- 25 prising chains *o'*, shafts *q* having universal joint connections, pulleys mounted upon said shafts to which said chains are secured, a vertically movable rod carried by the rotatable hopper, a cam-faced track upon which 30 the said rod bears, and a connection between said rod and said shafts.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

LÉON GEUZE.

Witnesses:

EDW. FORCE,  
V. D. HUNT.