

No. 868,639.

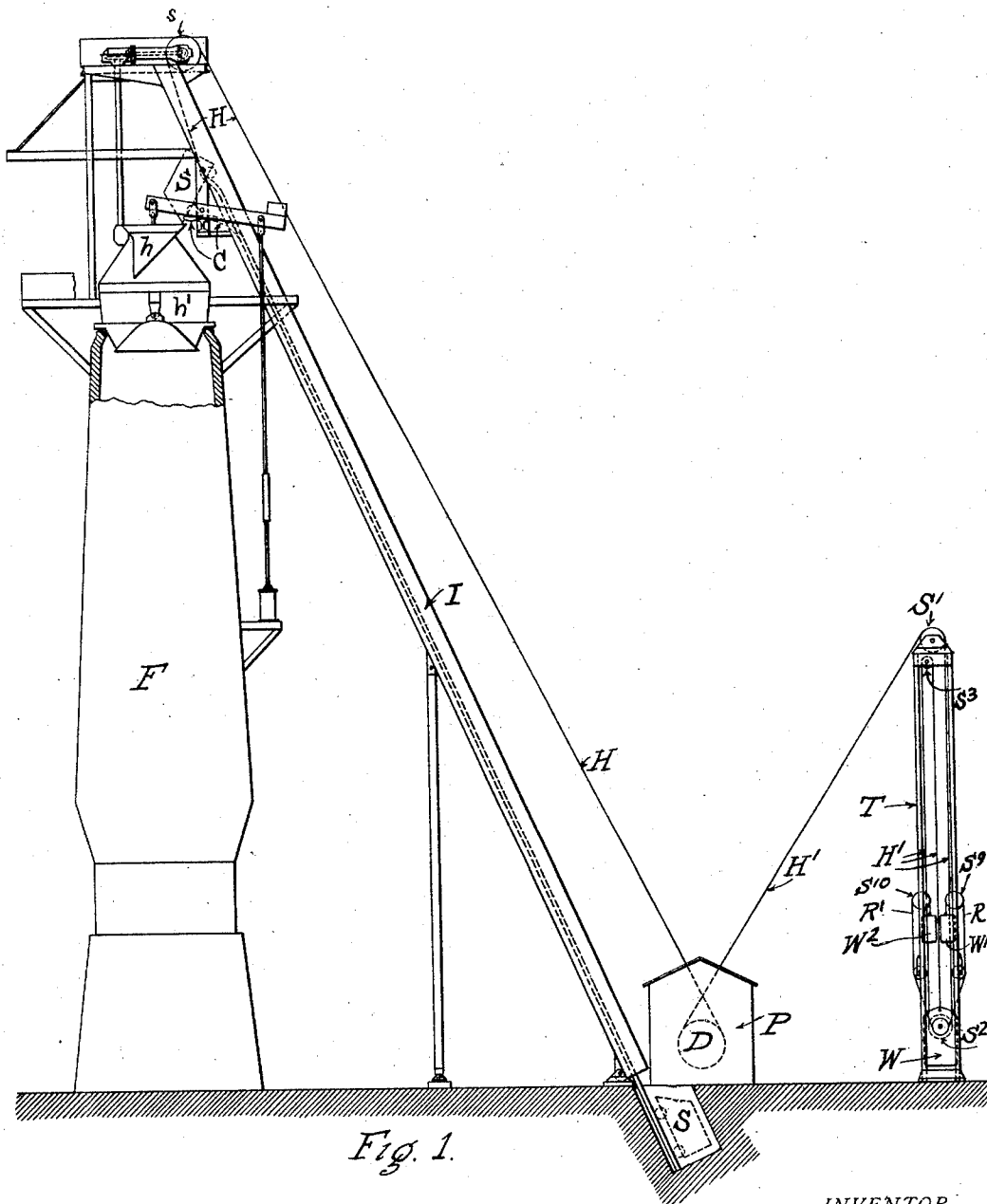
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A. E. BROWN.

MEANS FOR VARYING THE FORCE OF COUNTERWEIGHTS FOR HOISTING
SKIP CARS.

APPLICATION FILED FEB. 23, 1907.

2 SHEETS--SHEET 1.



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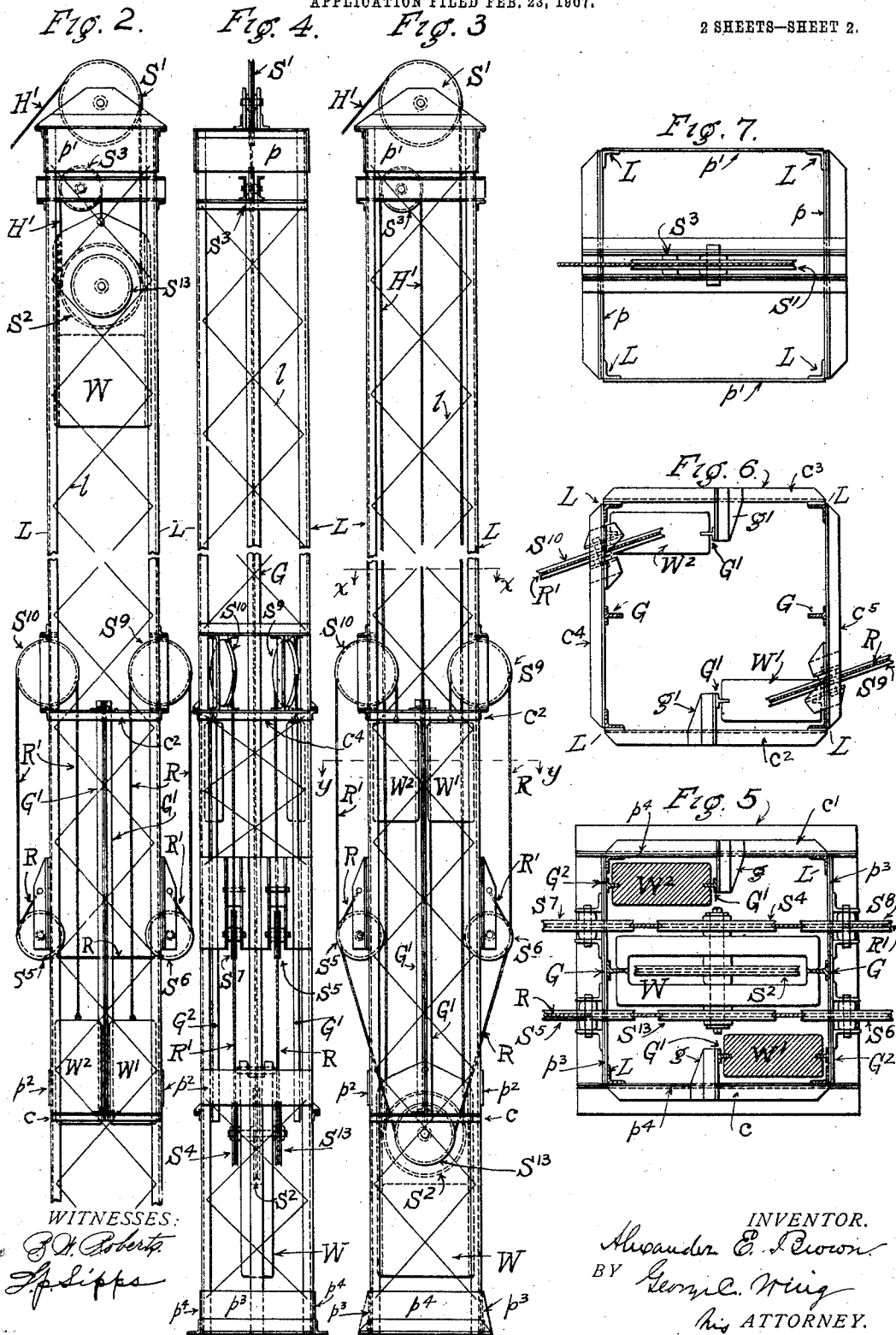
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SKIP CARS.

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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

ALEXANDER E. BROWN, OF CLEVELAND, OHIO, ASSIGNOR TO THE BROWN HOISTING MACHINERY COMPANY, OF CLEVELAND, OHIO.

MEANS FOR VARYING THE FORCE OF COUNTERWEIGHTS FOR HOISTING SKIP-CARS.

No. 868,639.

Specification of Letters Patent.

Patented Oct. 22, 1907.

Application filed February 23, 1907. Serial No. 358,911.

To all whom it may concern:

Be it known that I, ALEXANDER E. BROWN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Means for Varying the Force
5 of Counterweights for Hoisting Skip-Cars; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings as a part of the specification, wherein the same parts in every instance are design-
10 nated by the same letters.

My invention relates more particularly to the apparatus generally employed for bringing the materials with which a blast-furnace is to be charged from the stock-house or source of supply, by skip-cars that are
15 hoisted up an incline from the place of loading to the place of discharge at the furnace-top, and, to that special class of such apparatus, wherein an automatic discharge or dump of the car is secured by reason of the forward truck (or set of wheels) of the car being so arranged that, when the car reaches the furnace top they
20 will run off on an inwardly-curved track, of smaller gage than that on which the wheels of the rear truck travel, while said rear wheels continue to ride upwardly on the inclined track. In this sort of devices
25 the loaded car is drawn upwardly on the incline by a rope, passing over a sheave above the dumping point to the source of power below, and which is usually attached, at the front of the car to a bail that engages the rear of the same with the result that, as the front wheels
30 encounter the inwardly-curved track referred to, the continued pull of the hoist-rope will propel the car forwardly on said curve to and above the furnace top, and, at the same time, carry the rear of the car upwardly on the incline, and pivotally around the front
35 axle, until the load is dumped. The location of the front trucks with respect to the center of gravity of the car-body, and the weight of the latter, are such, that, as soon as the load is discharged, as above described, and the hoisting-drum is unclutched, the car, by its
40 own weight, will automatically right itself, regain the incline and be able to overhaul its hoist-rope and descend for another load. When however, as is very desirable, a counterweight is to be employed, to supplement the power-hoist, it is manifest that this can only
45 occur, with advantage, when some contrivance is supplied that shall materially reduce the pull of such counterweight on the hoisting-drum in order that such pull, when added to the weight or back pull of the hoist-rope shall not exceed the downwardly tipping force of the
50 car and thereby prevent the latter from regaining the incline.

The object of my present invention is to provide a reducing contrivance for a hoisting counterweight when used in the connection assumed, that shall reduce or

modify the normal force of such counterweight, gradually and elastically, from the moment the load meets said curve until it is discharged and righted itself, and, thereafter, shall gradually regain said normal while the car itself is regaining the incline for its return journey, and, all to such a degree as to enable said function to
60 be accomplished.

In the drawings Figure 1 is an elevation of a furnace with track-incline and hoisting counterweight system in connection therewith. Fig. 2 is an enlarged view of the tower arrangement, broken, as viewed from the
65 same point as in Fig. 1 when the main counterweight is near the top of the tower at the uppermost limit of its travel. Fig. 3 is a similar view as Fig. 2 when the counterweight is at the lowest limit of its travel. Fig. 4 is a similar view when conditions are the same as in
70 Fig. 3 but from a point ninety degrees from the point of view of that figure. Fig. 5 is a sectional view, on the lines *y, y*, of Fig. 3, Fig. 6 a like sectional view on the lines *x x* of Fig. 3, and, Fig. 7 is a plan view of
75 Fig. 3.

F represents a furnace of the usual type provided with a distributing hopper *h*, through which a receiving hopper *h'* below is supplied from time to time.

I indicates the incline that leads upward from the point at which the load is taken to a point above the
80 furnace top. Said incline carries the customary lower and upper trackways, or rails on which the front and rear trucks or sets of wheels of the skip-car *S*, are supported and travel. The lower of said trackways curves inwardly toward the furnace near the top as indicated
85 by the dotted lines *C* in Fig. 1. A hoist-rope *H* is connected with the car toward the rear of the same and is reeved around a sheave located on the incline above the furnace and is thence carried downward and fastened to a hoisting-drum *D* in the power-house *P*
90 below. Conveniently located with respect to said power-house is a suitable frame-work, or tower, *T* for the reception and operation of the counterweight system to be next explained.

S' is a sheave mounted on the top of said tower
95 around which is reeved a secondary hoist-rope *H'*, one end of which is wound around and affixed to the hoisting-drum *D* reversely to the hoisting-rope *H*, and, the other end, is carried downwardly in said tower *T*, to, and around a sheave *S*² that is loosely mounted within
100 the main or hoisting counterweight *W* within said tower. From thence the rope *H'* extends upwardly in said tower to and around a third sheave *S*³ and from there down to the counterweight *W* to which it is finally fastened.
105

As shown, the tower *T* is made up of four upright angles *L* held together at top and bottom by the oppositely related batten-plates *p p* and *p' p'* and *p*³, *p*³

and p^4 , p^4 , respectively, and any intermediate lacing necessary, as denoted in the drawings by the lines $l\ l$. At the middle points of the opposite transverse sides, or plates $p\ p$, are located guides $G\ G$ consisting, in this instance, of upright tees that extend throughout the tower T (Figs. 6 and 7). At a point near the base of the tower T , and on the opposite transverse sides of the same, as it is viewed in Fig. 3, are cross-pieces c and c' securely fastened to and against the angles L , and, at predetermined distances above said last-named cross-pieces, are further cross-pieces c^2 and c^3 , likewise fastened to said angles. Each pair of cross-pieces, (made up of c and c' , and c^2 and c^3 , respectively) carry interiorly-projecting guide supports, or bracket-like parts, $g\ g$ and $g'\ g'$, for upright tee-guides $G'\ G'$ that extend upright between the same. Opposite to each tee-guide G' is a corresponding upright tee-guide G^2 , each fastened, at its lower end, to the plates p^2 across said tower T , and, at its upper end, to cross-pieces c^4 and c^5 provided for the purpose.

On each side of the main counterweight W , and loosely mounted on its axle, are secondary sheaves S^{13} and S^4 , in planes parallel to said weight W , and, at a predetermined point or distance in said tower (corresponding substantially with the point the counterweight W will reach when the front wheels of the car S begin their departure from the incline along the curved portion C of the track) are two sheaves S^5 and S^6 on opposite sides, respectively, of the sheave S^{13} , and, in the same plane therewith. On opposite sides of the corresponding sheaves S^4 and in the same plane with said sheave, are likewise located the two sheaves S^7 and S^8 .

Fastened to the tower T , above the sheave S^5 , is a rope R that passes down and around the score of the sheave S^5 , across said tower, to and upwardly around the opposite sheave S^6 , to a further sheave S^9 above the sheave S^6 , and thence downwardly, over said sheave S^9 to a secondary counterweight W' below the same. In like manner a second rope R' is fastened to the tower T , above the sheave S^7 , and passes down and around the score of the same, across said tower, to and upwardly around its opposite sheave S^8 , above the sheave S^8 , to a further sheave S^{10} , and thence, downwardly, over said sheave S^{10} , to another secondary counterweight W^2 , below the same.

With respect to the dimensions and proportionate weight of the counterweight W , it is manifest that it must always be less than the skip-car S , as affected by the back-pull of the hoist-rope H , when said car is free to descend on its incline and such that the car shall not be retarded in its descent beyond the predetermined speed.

The counterforce to be executed by the weights W' and W^2 may, of course, be any amount desired that is less than the force it is to resist, and the best results will depend upon and be in the proportion that such weights, and their mode of operation, shall restrain and gradually reduce the positive-pulling force of the weight W , from its maximum, as it engages the ropes R and R' , to a predetermined minimum when the skip-car S has dumped its load, and the weight W has reached its lowest intended limit of travel. Said weight will then, of course,—beyond that determined for the same—exert no counter-action to the car's

backward tilt, and return to the incline, but, this being accomplished, the weight W will have regained its normal effect though exerted, as to the car's movement, reversely to that upon the hoist.

It is evident that, at the moment of starting up the incline I , the skip-car S is in the pit at the foot of said incline and the hoist-rope H unwound to its full working length. Under such conditions the counterweight rope H' , being wound reversely on the drum D from the hoist rope H , will be wound in to its full working length and the counterweight W , as represented in Fig. 2, will be at the extreme limit of its upward travel in the tower T .

The counterweights W' and W^2 will of course be at their lowest limit of travel, with the ropes R and R' , in consequence, extending in a horizontal taut position between their respective sheaves $S^5\ S^6$, and $S^7\ S^8$. As now the skip-car S ascends the incline the counterweight W will descend within the tower adding a full hoisting power against the loaded car meanwhile until, as said skip encounters the curved track C , and the weight to be hoisted is thereby gradually lessened, said W , in turn, will be gradually resisted by said subordinate counterweights W' W^2 as it sinks within the tower T and is finally neutralized and overcome at the very moment that the car is emptied and begins its return movement toward the main track. It is plain, that in all these movements there will be no resistance to the descent of the counterweight W at the moment its sheaves S^{13} and S^4 first encounter the ropes R and R' , when the latter are in the position above assumed, and that, at such moment, there will be in consequence, no diminution of its lifting force; but, it is further evident that, as said sheaves descend in their engagement with said ropes, the resistance to them, according to well-known rules and calculations, will gradually increase from zero toward infinity, until an actual maximum of resistance is reached which is determined in each case by the special movement allowed to the auxiliary counterweight W' and W^2 by the condition of the structure, and that the lifting force of the main counterweight W will consequently be gradually diminished until the car S has made its dump.

Although I have shown and described a special arrangement of sheaves and secondary counterweights to accomplish the end desired, I do not mean to be limited to such special arrangement in the broader sense. Any arrangement of ropes, pulleys and weights which the main counterweight shall encounter—in gradual opposition—at and from the moment the front wheels of a skip-car diverged from the upward incline until it regains the same, should equally be construed as coming within the scope of my invention.

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

1. A means for varying the force of counterweights for hoisting skip-cars, consisting of one or more pulley and weight systems, suitably located, in the path of said counterweight, to become in engagement with and resist the same, while said car is undergoing its dumping movements, substantially as shown and described.

2. A means for varying the force of counterweights for hoisting skip-cars, consisting of one or more pulley and weight systems, suitably located in the path of said counterweight to be in opposite engagement with the same while said car is resuming its normal position on the incline after dumping, substantially as shown and described.

3. A means for varying the force of counterweights for hoisting skip-cars, consisting of the combination, with said skip-car, of a furnace incline carrying a track for the rear wheels of said car that extends above the furnace top, and an intermediate track for the front wheels thereof that curves inwardly toward said top, suitable power mechanism for hoisting said car on said incline, with a suitable counterweight system to supplement said power mechanism in hoisting said car upwardly on said track, together with a secondary counterweight system, as described to gradually resist the hoisting force of said first-named system, and reduce the same to a predetermined minimum when said car is brought to its position for dumping, substantially as shown and described.
4. The combination with an incline, provided with a track for the rear wheels of a skip-car, and an intermediate track for the front wheels thereof that curves inwardly from the incline to the furnace top, of a skip-car and a suitable counterweight arrangement for hoisting the same, together with a secondary system of pulleys and counterweights arranged at a point in the travel of said hoisting counterweight to become and be in engagement therewith while said front wheels are on said intermediate track for

and after the operation of dumping, substantially as shown and described.

5. The combination with an incline, provided with a track for the rear wheels of a skip-car and an intermediate track for the front wheels thereof, that curves inwardly from said incline toward the furnace top, of a skip-car, and suitable power mechanism for hoisting the same on said tracks, and a counterweight, suitably related to said power mechanism to supplement its hoisting force, the said counterweight being operatively located in a supporting tower or frame-work provided with a system of sheaves or pulleys and weights with the ropes thereof extending in tension between oppositely arranged sheave members of said system across the path of travel of said hoisting counterweight in position to become and be engaged and resisted thereby, when, in the operation of hoisting and dumping said skip-car, its front wheels are on said curve, substantially as shown and described.

ALEXANDER E. BROWN.

In the presence of—

RICHARD BRINSLEY SHERIDAN,
ARTHUR MARWOOD MERRYWEATHER.