No. 858,004. PATENTED JUNE 25, 1907.

S. S. KNIGHT.

CUPOLA CHARGING MECHANISM.

APPLICATION FILED JAN. 28, 1905.

3 SHEETS—SHEET 1.

Fig. 13.

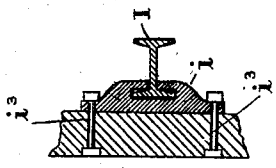

Fig. 1.

Witnesses.

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3 SHEETS—SHEET 2.

Fig. 2.

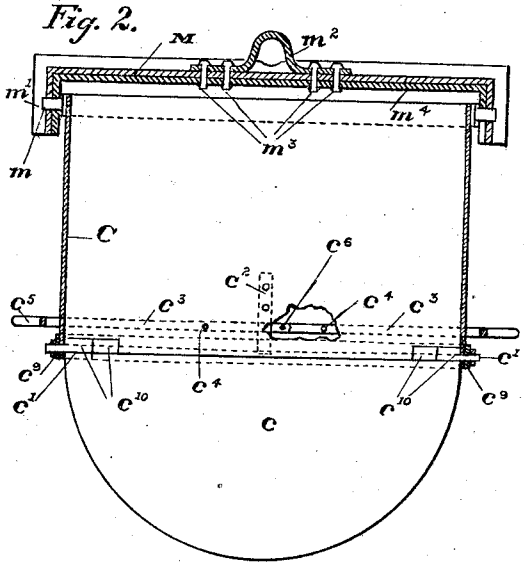


Fig. 3.

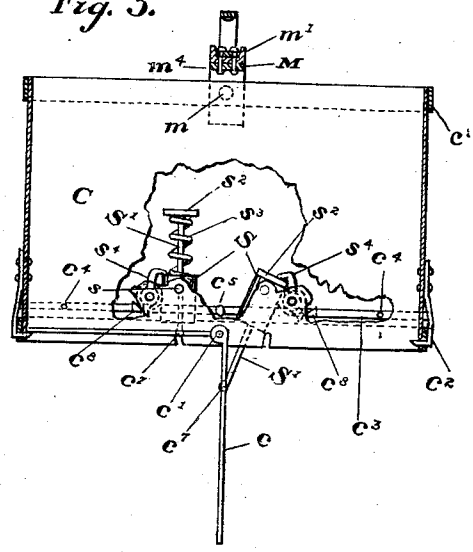


Fig. 4.

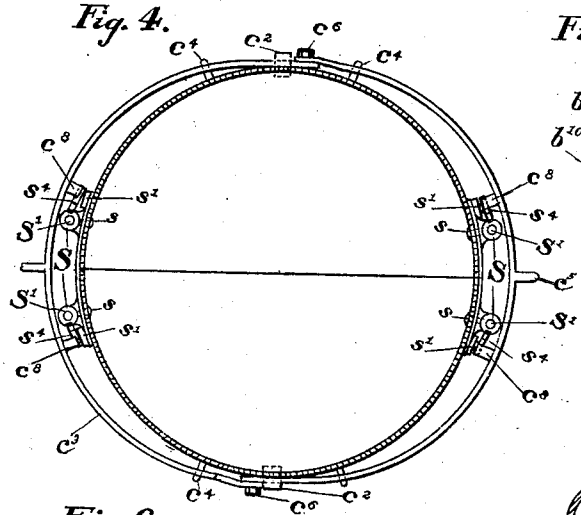


Fig. 5.

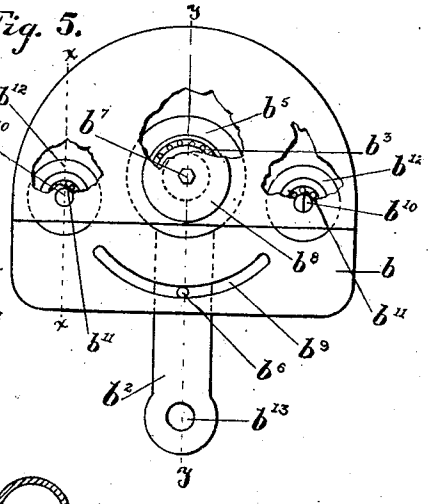


Fig. 6.

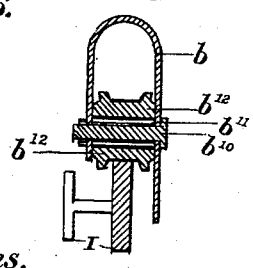
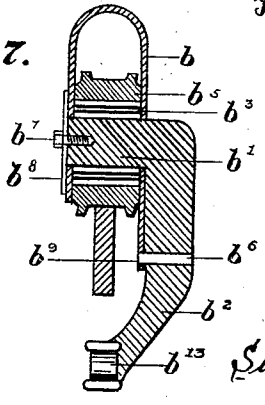


Fig. 7.



Witnesses.

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3 SHEETS—SHEET 3.

Fig. 11.

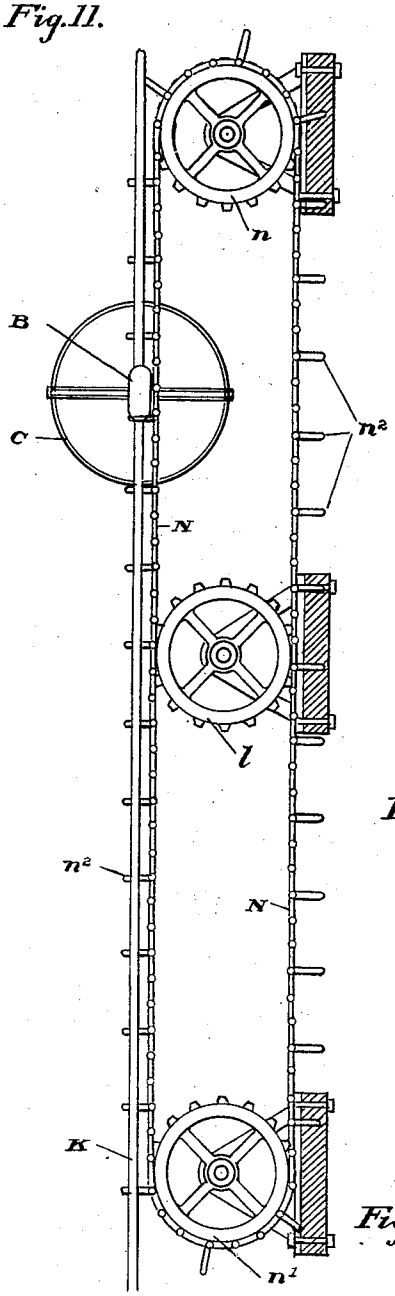


Fig. 8.

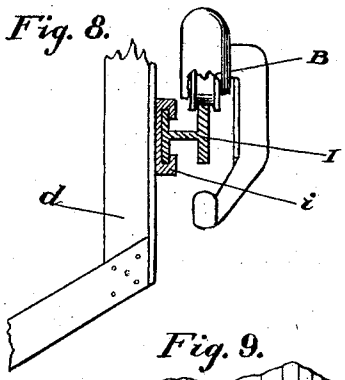


Fig. 9.

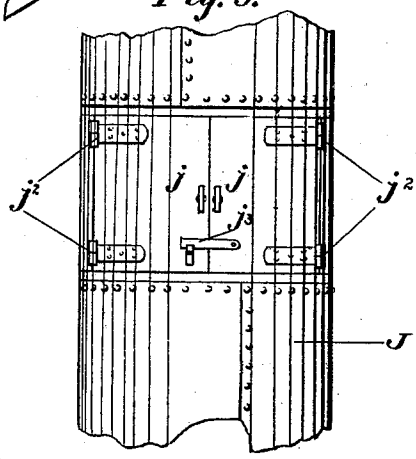


Fig. 10.

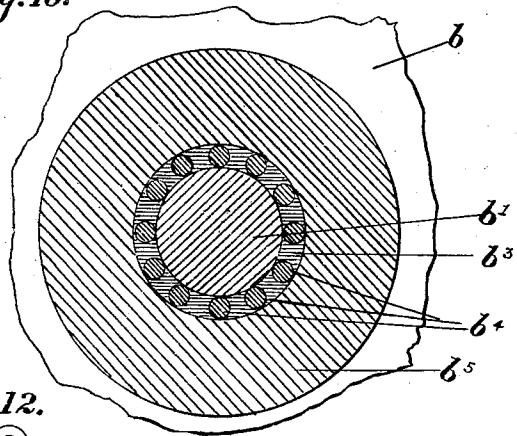
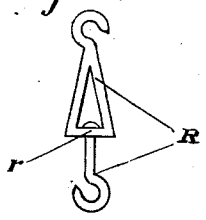


Fig. 12.



Witnesses.
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C. H. Jones

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UNITED STATES PATENT OFFICE.

SHERWOOD S. KNIGHT, OF BIRMINGHAM, ALABAMA.

CUPOLA-CHARGING MECHANISM.

No. 858,004. Specification of Letters Patent. Patented June 25, 1907.

Application filed January 28, 1905. Serial No. 243,068.

To all whom it may concern:

Be it known that I, SHERWOOD S. KNIGHT, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented new and useful Improvements in Cupola-Charging Mechanism, of which the following is a specification.

My invention relates to improvements in mechanism for charging cupolas and smelting furnaces. Old devices have proved inadequate to permit of rapid, economical and satisfactory handling of the raw material in modern foundry practice. The herein described mechanism saves time and labor and permits more even charging of the cupola.

My invention is illustrated in the accompanying drawings, in which:—

Figure 1, is an elevation of the charging platform cupola, stock hoist, swivel conveyer hood, charging bucket, decline and retarding device; with such parts in section as are necessary to properly illustrate and show the construction and operation. Fig. 2, a detail, is an elevation of the charging bucket, showing the bail, in section, and one door dropped. Fig. 3, a detail, is an elevation of the charging bucket showing end view of bail, one door raised, the other dropped, and the mechanism for operating and holding the doors. Fig. 4, a detail, is a bottom plan view of the charging bucket and mechanism for operating the drop doors. Fig. 5, a detail, is a side elevation of the multiple wheel trolley hood. Fig. 6, a detail, is a vertical axial section through one of the small wheels and the hood, along line x, x. Fig. 7, a detail, is a vertical axial section through the track hanger large wheel and attendant parts of the trolley hood along line y, y. Fig. 8, a detail, is a means of providing an I beam as a slidably removable track and shows means of attachment; also hood in position. Fig. 9, a detail, shows cupola with parts broken away, and doors that close openings. Fig. 10, is a vertical lateral section through trolley wheel bushing, pin and attendant parts. Fig. 11 is a top plan view of retarding device. Fig. 12, is a swivel "S" hook. Fig. 13 is a sectional detail showing particularly the trolley rails and the bracket i therefor.

My invention comprises a stock yard trolley track a small portion of which is shown designated, as A, a trolley hood, B, containing wheels adapted to travel thereon, a charging bucket, C, depended from said trolley hood mechanism, an elevator chute, D, and engine, E, with sheaves, F, adapted to raise the charging bucket, C, within the chute, D, by means of rope or cable, G, operating over the sheave, H, slidably a removable track rail, I, a cupola, J, with an opening through its opposite walls sufficient to permit the passage of the bucket, a slanting track or trolley, K, on which the bucket is returned to stock yard track, and a retarding device, L, to automatically secure to the lowering bucket safe speed; all as shown generally in Fig. 1.

By further reference to the drawings it will be seen that track, A, may be supported in any suitable manner, as by a series of posts, a, trestle, hanger or the like. At a point, a^1, on said track, within the elevator chute, D, the track may be broken or terminated, so that the hood, B, may be transferred to a suitable sustaining hook, g, preferably a piece of track fastened rigidly underneath the elevating platform, g^1. This platform is raised by a cable which passes over the sheave wheel, H, which may be suitably fastened to the frame of the chute, D. From the sheave H, the cable passes over the sheave, f, from there over the sheave f^1. The sheaves, f, and f^1, may have single or multiple grooves according to the distance the bucket is to be raised. The sheave, f, has its boxing, f^2, rigidly fastened to a suitable frame work, F^1. f^1 is movably attached to the piston rod, e, of the engine, E. When steam is fed into the engine, E, through the pipe, e^1, and the valve, e^2, the piston, e^3, is forced back carrying the piston rod, e, the boxing, f^3, and the sheaves, f^1, raising the platform, g^1, and hook, g. The trolley rail, I, which may be slidably attached to supports, d, d, by any suitable attachment, as i, is placed in position, extending through the cupola from side to side, when ready to receive the load and convey it from, g, to a point within the cupola where the bucket is emptied of its load. The attachments or brackets i may be cross-slotted from side to side to receive one portion of the beam or rail I, as shown in Fig. 8, said brackets being secured to the frame work which supports them by bolts i^3, or in any other convenient manner.

The cupola or smelting furnace is of the usual construction except that at the height where it is to be charged, there are openings, j^1, of size and shape adapted to allow the loaded bucket to enter on one side and the

empty bucket to pass out on the opposite side. These openings may be closed with any suitable doors, as j, j, which swing into and out of position and are held in place by hinges j^2 and catches j^3.

The trolley hood, B, is adapted to swivel freely so as to maintain proper position and act freely even when it is descending from the cupola on a track considerably inclined, say 45°. It is composed of an outer shell, b, which is preferably made in one piece as shown in Figs. 6 and 7, with one side extended downward farther than the other. At a convenient point it is pierced from side to side by the upper portion, b^1, of a hooked member, b^2, to which the load is attached. Surrounding, b^1, is a bushing, b^3. This bushing is of the roller-bearing type with hardened rolls, b^4. Trolley wheel, b^5, surrounds this bushing and bears on the rail. A set screw, b^7, passing through a washer, b^8, is threaded into b^1, and holds it in position. A pin, b^6, pierces, b^2, and is held in place in any convenient way as by driving or threading. The portion of this pin that projects inwardly fits a slot, b^9, cut in the shell, b, so as to be an arc of a circle described with the center of b^1, as its center.

At two points below, b^7, and on each side thereof, preferably equidistant therefrom and beyond the ends of the slot, b^9, the shell is pierced by pins, b^{10}, with a head on one end thereof and a nut on the other. Surrounding b^{10}, is a roller bushing, b^{11}, and surrounding this the trolley wheel b^{12}. These trolley wheels bear on the rails, A, I, and K, successively as the bucket is forwarded, the same as the wheel b^5.

From a hook, as an ordinary swivel, "S" hook, R, swiveled at, r, fastened through, hole b^{13} made in the hanger, of the trolley mechanism, is suspended the charging bucket, C, with its bottom formed of two semi-circular doors, c, hinged to a shaft, c^1, which extends across the middle of the bottom of the bucket. Hinges, c^{10}, made by bending over a projection at the back of the doors, may be at the ends only and throughout the rest of the distance the doors backs project sufficiently to rest on the shaft, serving to sustain the doors while the bucket is loaded and to protect the shaft while the bucket is being loaded.

At the top and bottom the bucket is preferably bound with heavy iron bands, c^9, to insure rigidity and to insure proper attachments for the bail, shaft and door dropping, elevating and sustaining mechanism. When raised the doors are held in position by spring catches, c^2, which extend under and sustain the doors. Around the bucket and near the lower end are two semi-circular levers, c^3, each with two fulcrum pivots, c^4, and each having a handle, c^5. These levers are articulated at their ends by a pin, c^6, or other convenient connection so that motion applied to one is immediately operative in like manner upon both. These levers fit closely under the spring catch, c^2, so that a movement of the lever handle, c^5, downward, forces c^2, backward out of contact with the door, c, and the door drops emptying the bucket.

As shown in Figs. 2 and 4, each lever extends under the catch, c^2, on one side and short of the opposite catch, c^2, on the other side. At each articulation point one lever overlaps the other and a pin, c^6, pierces both. The withdrawal of both these pins make the operation of the levers entirely independent and each door may be dropped independently of the other. Now as the hook, R, is swiveled and either door can be dropped, any inequality in the charged cupola may be corrected as the contents of a part or all of one or more buckets may be dumped in any desired place. The doors may be raised by hand or provision may be made for raising them, consisting of a tubular spring case, S, swivelly attached to the bucket above the line of travel of the lever c^3, by any suitable means as the bolt, s. The spring case, S, is open at its upper end and closed at its lower except where it is pierced axially by the plunger, S^1. This plunger is pivotally attached at its lower end to the door, at c^7, its upper end terminates in a plate, s^2, on the under side of which the coiled spring, s^3, seats. The spring is placed within the spring case, is compressed (by any suitable means not shown), between the inner end of the spring case, and the plunger plate, and is held compressed by lever pawl, s^4, pivoted to a projection, s^1, from the spring case which is movable with it. The spring is of a tension adapted to rapidly and readily raise the door, c, when the load has been dropped. Upon the levers, c^3, are fixed wedges, c^8, adapted to engage the outer end of the lever pawl, s^4, when levers, c^3, are raised and release the springs, s^1, thus jerking the doors, c, into horizontal position ready for the bucket to be reloaded. The operation of the part c^3 as a lever to force outward the catches c^2 is by changing the lever, which is a flat band of iron, from a vertical position to an oblique one, by its turning upon the pivot, c^4. Also, the springs s^3 are compressed by putting pressure on the underside of the spring case S and on the upper side of the plunger head S^2; the function of the springs is to close the doors and their operation is by releasing the catch in the top of the spring case.

At the upper end of the bucket are trunnions, m, upon which is hung through suitable perforations the bail, M, which for simplicity and strength may be made of channel iron, m^1, strengthened if desired by an iron plate, m^4, suitably formed. The ring for hook, may then be made of a forging, m^2,

bolted or riveted through the main portion of the bail, by bolts or rivets, m^3.

When the empty bucket leaves the cupola and starts down the rail, K, the speed with which it descends is controlled by a sprocket chain, N, or similar device which passes over sprocket wheels, n, l, and n^1. Links, n^2, with right angle projections, engage the trolley hood, B, or a projection attached thereto and prevents the bucket from descending faster than the chain.

The chain, N, engages the sprocket wheel, l, which is rotatively attached to its shaft, l^1, and the water wheel, l^2, on the lower end thereof. This wheel is immersed in a tank, O, of water or other fluid, o, which retards the rotary motion of the shaft and its attendant parts. The size and construction of the wheel and attendant parts are proportioned to the load to be held back, the slant of the track, etc. At a point, n^3, the inclined track meets the level of the yard track from which the trolley device and bucket are taken off to the storage yards for another load.

The operation of my improvements are as follows: A loaded bucket of my improved type depended from trolley line is forwarded to a^1, transferred to, g, at that point, steam enters the engine, through e^1 and e^2, the piston, e^3, is forced back spreading the sheaves, f, and f^1, thus elevating the load to end of track, I. The trolley is rolled forward on the track I, into cupola, J, and when bucket is in proper position, c^5, is pulled downward when the doors, c, drop and the contents of the bucket fall straight down forming an even layer in the cupola. The trolley, B, is now forwarded to the upper end of the track, K, and entering upon same is caught by a projection link of chain, n^2, of chain, N, which operating over sprocket wheel, l, rotatively attached to water-wheel, l^2, immersed in water, o, retards through, l^1, l and N, the motion of trolley and bucket, so that they descend gradually to n^3, where the trolley enters the level of the track rail. At the point of loading, the lever, c^5, is pushed up releasing the springs, s^3, which jerk the doors, c, up into position where the springs, c^2, catch and hold them. Now the springs, s^3, are caught after compressing, by the pawl, s^4, and the bucket is then ready to load and return to the cupola. When through charging the cupola the rail I is slid back out of the way, to the right.

I claim as my invention and desire to secure by Letters Patent of the United States:—

1. In mechanism for charging cupolas, the combination of a cupola with opposite openings at the charging level, yard tracks, a conveyer, adapted to travel thereon, a charging bucket having a dumping bottom formed of swinging sections, means for latching said sections and allowing them to be released, means for elevating the conveyer and bucket, a track adapted to pass through the cupola openings, a track on the exit side of the conveyer adapted to return the conveyer and bucket to the yard track level, and means for retarding the travel of the conveyer along the return track.

2. In mechanism for charging cupolas, the combination of yard tracks, a conveyer adapted to travel thereon, a charging bucket with its bottom formed of two semi-circular doors hinged to one shaft and held in horizontal position by spring catches attached to the bucket frame with means for disengaging said catches at will, means for elevating said conveyer and bucket, a cupola provided with opposite openings at the charging level, a removable track adapted to pass through said cupola openings; on the exit side of said cupola a track adapted to return conveyer and bucket to the yard track level and means for retarding the speed of said conveyer and attendant parts as they descend said return track, substantially as set forth.

3. The combination with a cupola and two tracks arranged at different levels one of said tracks passing through the cupola and the other track being a yard track, an inclined return track connecting with the other track, a conveyer adapted to travel on said tracks having a charging bucket adapted to deliver its load into the cupola, and means for retarding the travel of the conveyer and bucket along the inclined return track.

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

SHERWOOD S. KNIGHT.

Witnesses:

JOSEPH R. GARDNER,

C. H. JONES.