No. 818,927. PATENTED APR. 24, 1906.

E. E. WAITE.

CASTING MACHINE.

APPLICATION FILED JUNE 24, 1905.

5 SHEETS—SHEET 1.

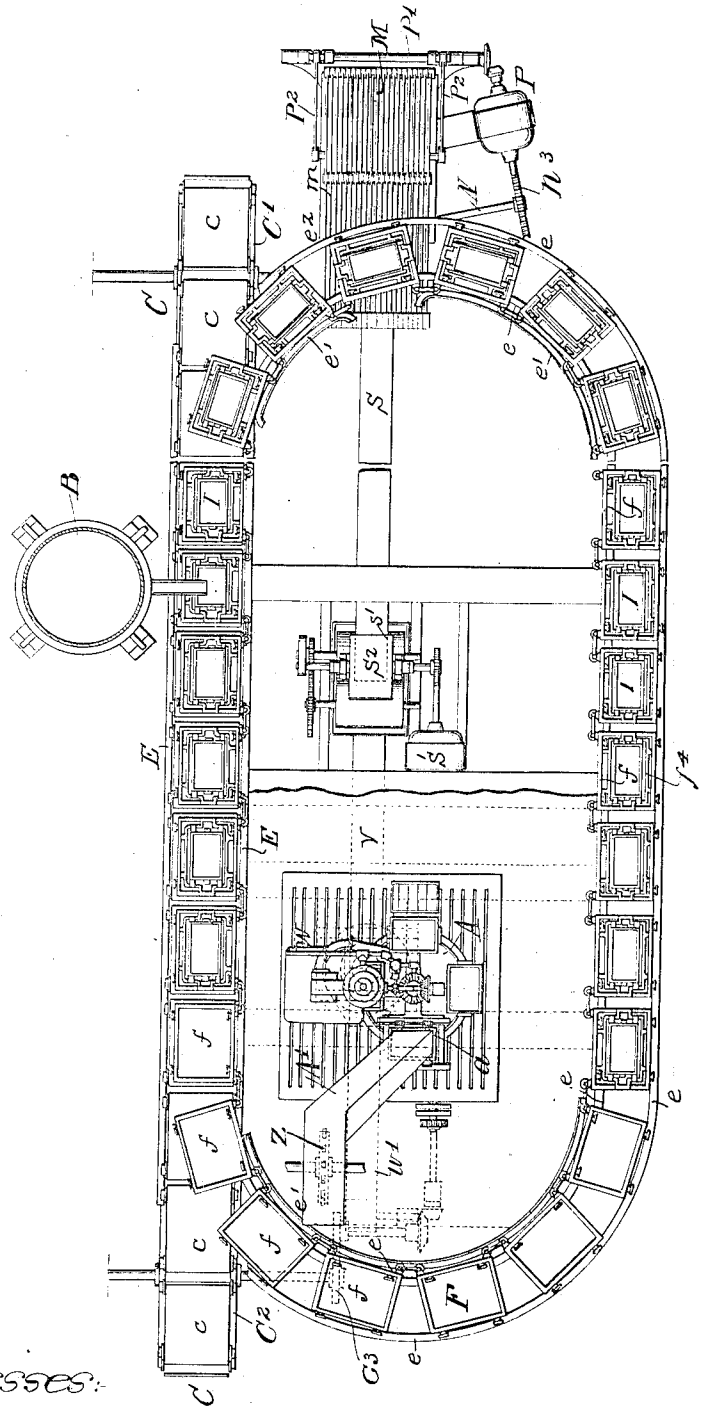


Fig. 1.

Witnesses:
Walter J. Pullinger
Titus W. Sous.

Inventor:
Edwin E. Waite.
by his Attorneys.
Howson & Howson

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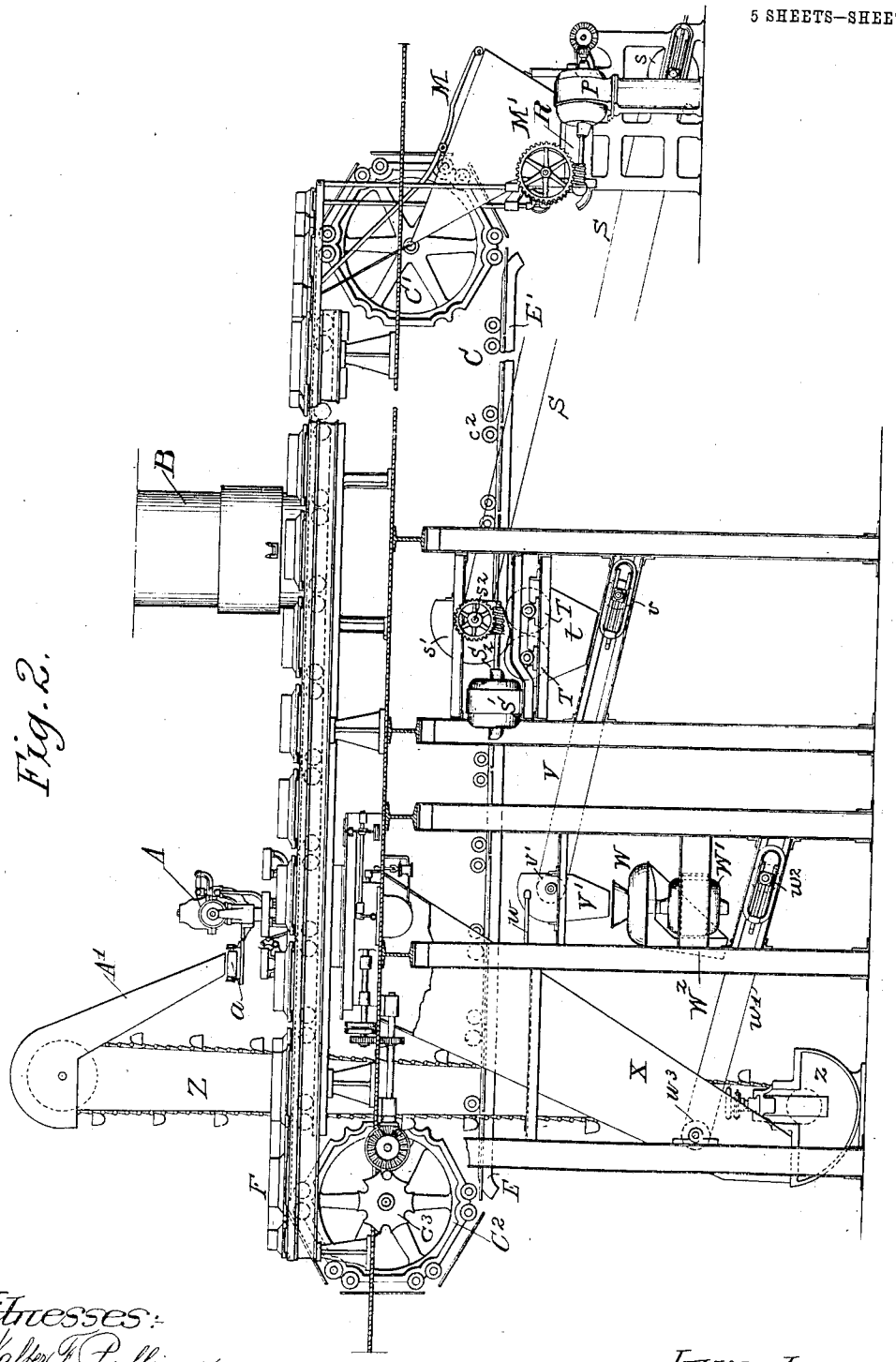


Fig. 2.

Witnesses:
Walter F. Pullinger.
Titus A. Sors.

Inventor:
Edwin E. Waite.
by his Attorneys,
Howson & Howson

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5 SHEETS—SHEET 3.

Fig. 3.

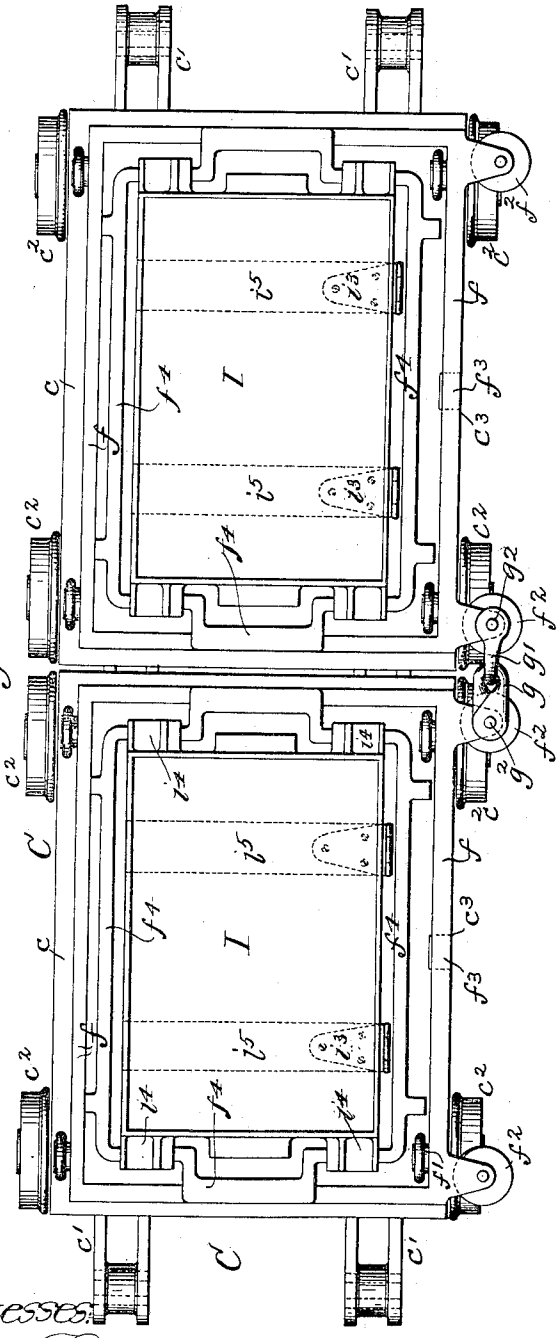
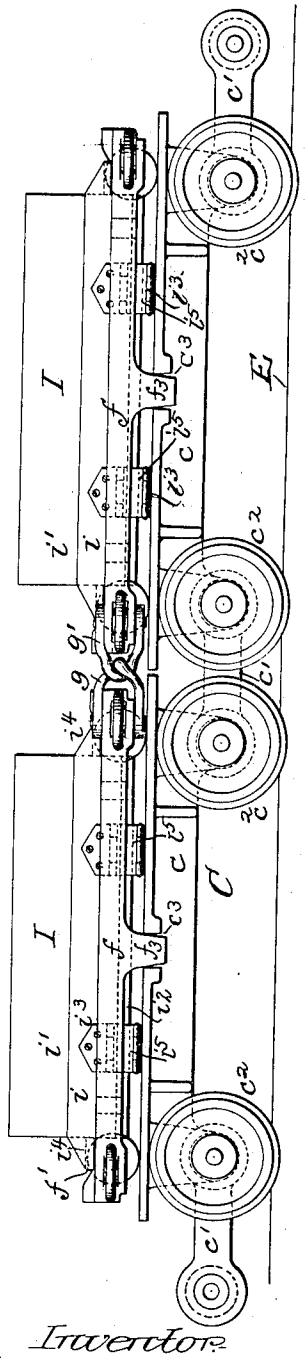


Fig. 4.



Witnesses:
Walter J. Pullinger.
Titus H. Sous.

Inventor:
Edwin E. Waite
by his Attorneys,
Howson & Howson

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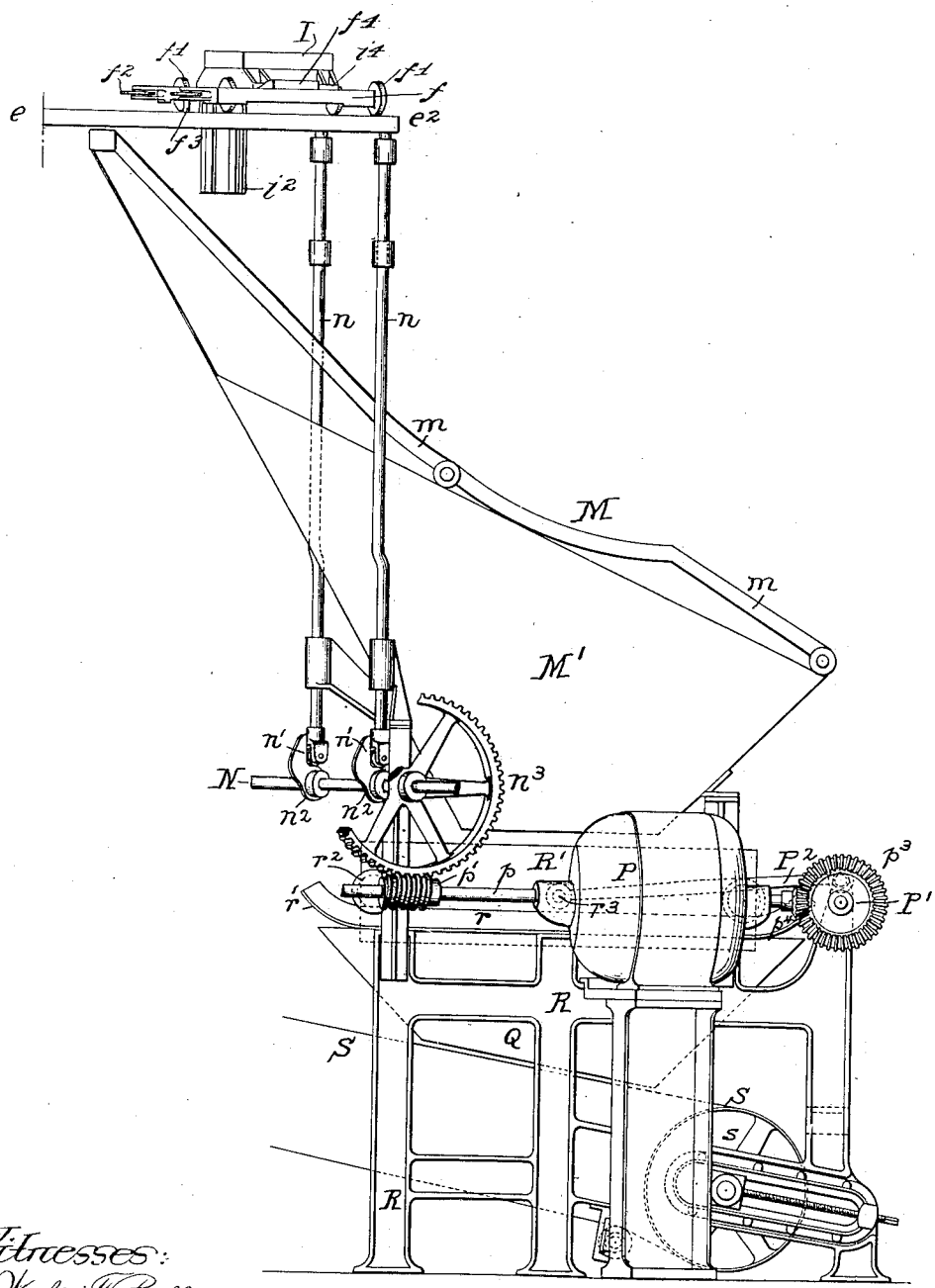
E. E. WAITE.

CASTING MACHINE.

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5 SHEETS—SHEET 4.

Fig. 5.



Witnesses:
Walter F. Bullinger
Titus A. Sous.

Inventor:
Edwin E. Waite.
by his Attorneys:
Howson & Howson

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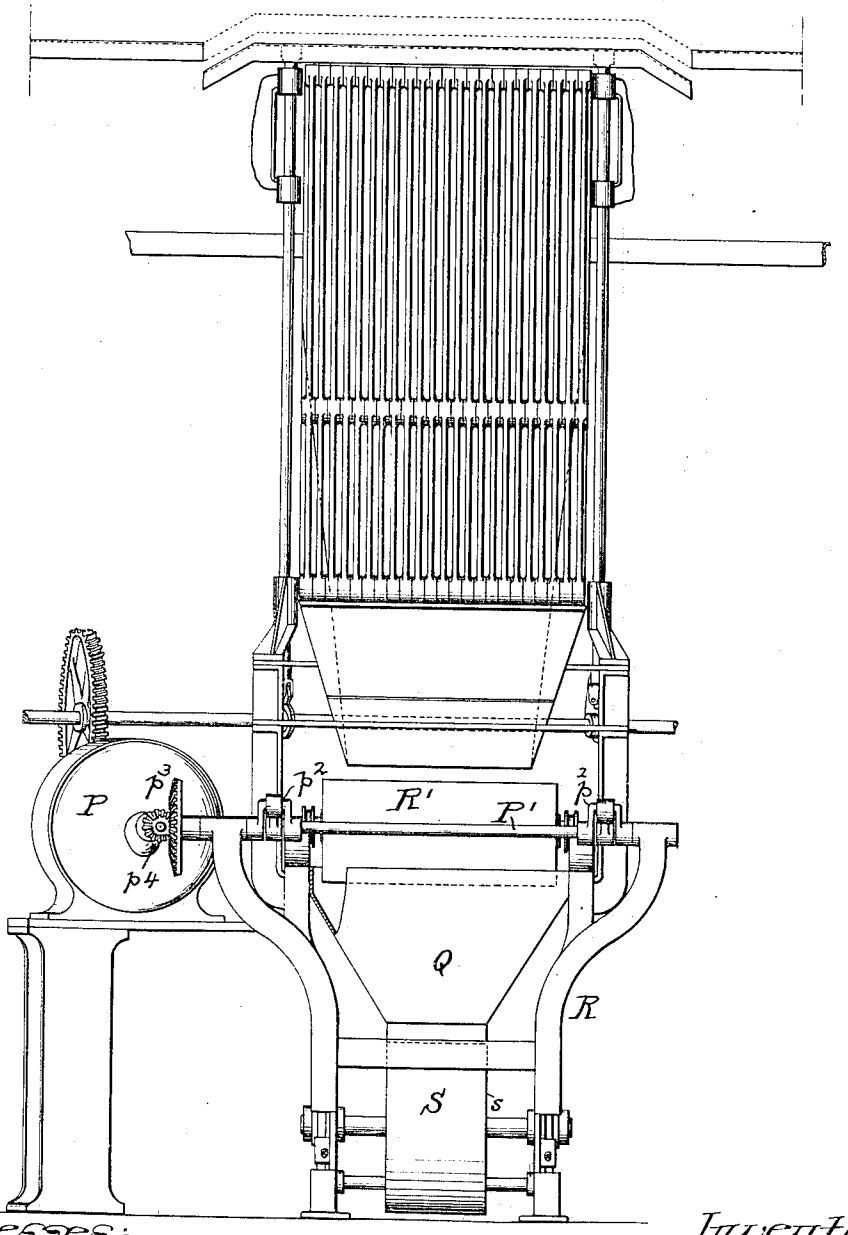
E. E. WAITE.

CASTING MACHINE.

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5 SHEETS—SHEET 5.

Fig. 6.



Witnesses:
Walter F. Pullinger.
Titus H. Sosso.

Inventor:
Edwin E. Waite.
by his Attorneys,
Howson & Howson

UNITED STATES PATENT OFFICE.

EDWIN E. WAITE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE ENTERPRISE MANUFACTURING COMPANY OF PENNSYLVANIA, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

CASTING-MACHINE.

No. 818,927. Specification of Letters Patent. Patented April 24, 1906.

Application filed June 24, 1905. Serial No. 266,798.

To all whom it may concern:

Be it known that I, EDWIN E. WAITE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Casting-Machines, of which the following is a specification.

One object of my invention is to construct an apparatus for conveying a mold from a molding-machine to a cupola-furnace where the metal is poured, and to discharge the flasks, separating the sand from the metal, and returning the flasks to the molding-machine and the sand to the sand-hopper.

The invention consists, essentially, of two endless conveyers of a sufficient length so that the metal after being poured is allowed to set before the mold is broken up and the sand separated from the metal.

The machine is so designed that it will receive the flasks from the molding-machine and convey them to a point under the spout of the cupola-furnace or pouring-ladle. This necessitates an intermittent motion, and as the molding-machine must have an intermittent motion the two machines are geared together, so that they will work in unison. The machine is also so constructed that the flasks are carried by one conveying apparatus until the conveyer-flask reaches a certain point, when it is removed from its conveyer and carried solely by another conveyer back to the molding-machine. The sand is recovered and treated as it is conveyed from the point where the mold is discharged to the sand-hopper above the molding-machine, so that it will be in proper condition for use.

In the accompanying drawings, Figure 1 is a plan view of my improved casting-machine. Fig. 2 is a view in elevation, showing the improved machine. Fig. 3 is a plan view showing two carriages and two carriers, the carriers being mounted above the carriages. Fig. 4 is a side view of Fig. 3. Fig. 5 is a view in elevation, drawn to an enlarged scale, showing the separator and sand-screen, and Fig. 6 is an end view of Fig. 5.

A is a molding-machine. This molding-machine can be of any type desired. In the present instance I have shown a molding-machine which is fully illustrated in the United States patent granted to John W. Brown, Jr., on the 15th day of September, 1896, and numbered 567,884. This machine consists of a rotary carrier upon which the copes and drags are filled with sand to form the mold, rammed, and completed. Then the copes and drags are removed and placed in position on the carriers to be transferred to position in front of the cupola-furnace B. This cupola-furnace can be of any of the ordinary types, and the metal can be either poured directly from the furnace into the molds, or a ladle can be used, if desired.

C is an endless-belt conveyer made up of a series of platforms *c*, connected together by links *c'*, as clearly illustrated in Figs. 3 and 4, and on these platforms are mounted flanged wheels c^2, which are adapted to travel on tracks E, forming part of the permanent structure of the apparatus. These tracks can be of any suitable shape and secured to the structure of the building in any suitable manner. The return-run of the conveyer C is preferably carried by tracks E', clearly illustrated in Fig. 2.

At each end of the apparatus are sprocket-wheels C' and C^2, around which passes the platform conveyer C. In the present instance the sprocket-wheel C^2 is the driving-wheel, being driven from the shaft which drives the molding-machine.

The molding-machine is provided with star-wheel action, so that it will rotate intermittently, and I preferably provide a star-wheel gear c^3 for the conveying mechanism, so that it will operate intermittently and in time with the molding-machine; but it will be understood that the timing is such that the molding-machine will make two intermittent movements to the one intermittent movement of the conveyer. The molding-machine first makes a cope and then a drag, while both the cope and drag of the flask are mounted together on the platform conveyer. The particular driving mechanism, however, I lay no claim to, as this does not form a part of my invention.

The platforms *c* are preferably made flat for the reception of the flask containing the mold, as it will be understood that the flasks are supported solely by the platforms *c* while they are being conveyed from the molding-machine to a point passing the cupola, so as to avoid the possibility of the mold becoming damaged by jarring of parts of the apparatus.

In order to carry the flasks from the con-

veyer C to a point where they are discharged and to return the flasks to a position in close proximity to the molding-machine, I provide a horizontal conveyer F, made up of a series of open frames *f*. These frames are clearly illustrated in Figs. 3 and 4 and have rollers *f'*, by which they are supported on the platform C and which later travel on rails *e e*. These rails are curved at each end and are so situated in respect to the platform-carrier C that the frames *f* pass onto the platforms *c* of the platform conveyer at one end of the machine and pass off the platforms onto the rails *e e* at the opposite end of the machine. These frames do not support the flasks while they are on the platform conveyer, but simply are in position to carry the flasks from the conveyer when they reach a given point. Wheels f^2 are mounted at one side of each frame *f*, and guard-rails *e'* are provided at each end of the machine, and the wheels f^2 bear upon these guard-rails while passing around the ends, as clearly illustrated in Fig. 1.

In order that the frame conveyer F will travel at the same speed as the platform conveyer, I recess the platform *c* at c^3 and provide the frames *f* with lugs f^3, which enter the recesses in the platforms, as they travel onto the platforms, as illustrated clearly in Figs. 3 and 4. The frames *f* are connected together at their inner edges by links *g g'*, one set at right angles to the other and preferably shaped as in Figs. 3 and 4. The links are pivoted to the pins g^2, carrying the roller f^2. By this construction the frames are properly connected, yet will have freedom of motion to accommodate themselves to the platform *c* and to the agitating mechanism at one end of the machine, which acts to discharge sand from the flasks.

I represents the flasks, which are made in the ordinary manner, having cope and drag sections *i* and *i'* and a bottom board i^2; but in this instance the bottom board is secured to the flask by hinges i^3, and these hinges are made double in the present instance, so that when the bottom drops it will drop clear of the sides of the flask, so as to allow all of the sand to be discharged from the flask. In the present instance the bottom board i^2 has battens i^5, and these battens rest directly upon the platform C, the bottom board carrying the entire flask. On each end of the flask are lugs i^4, which extend over a supplemental frame f^4, which is carried by the main frame *f*. The opening in the supplemental frame f^4 can be of a size to correspond with the size of the flask and is so proportioned that the supplemental frame will fit in the main frame *f*. By this construction flasks of different sizes can be used by simply removing one set of supplemental frames and substituting others. It will be noticed, on referring to Figs. 3 and 4, that while the flasks I are on the platforms of the conveyer C they do not touch either the supplemental frames f^4 or the main frames *f*; but as soon as they pass from the platform conveyer they are carried solely by the frame conveyer F.

M is an inclined screen made up of a series of bars *m*, spaced a sufficient distance apart to allow sand to freely pass, but to prevent the passage of a casting. This screen extends under the rails *e e*, and the space between the rails is open, so that when the frames carrying the flasks pass from the platforms *c* the bottom boards i^2, which are hinged to the flasks, will drop, causing sand to drop from the flask onto the grating, and as the sand and the casting slide down the inclined bars the sand will pass through the spaces between the bars, while the casting will pass over the bars and be discharged at one end. Directly under the grating M is a hopper M', in which sand is collected and discharged into a screen, which will be described hereinafter.

In order to remove all the sand from the flasks, I preferably provide means for agitating or knocking the flasks, causing the sand to dislodge and be discharged. In the present instance I mount two vertical rods *n n* directly under a portion e^2 of the outer rail, upon which the conveyer F travels. These rods have rollers *n'* at their lower ends, acted upon by cams n^2 on the shaft N, provided with a worm-wheel n^3, which is illustrated in Fig. 5 as broken away to more clearly illustrate the cams. This worm-wheel meshes with a worm *p'* on a shaft *p* of an electric motor P in the present instance, so that as the shaft N revolves the cams will give a knocking or jarring motion to the rail e^2, causing the sand to be dislodged from the flask. When the frame conveyer F carries the flasks to a point near the molding-machine, they are removed from the conveyer and the cope and drag placed in position on the molding-machine, to be refilled and packed with sand. There is sufficient lapse of time from the pouring of the metal to the discharge of the sand and casting from the flask that the metal will be sufficiently cold and set, and the conveyers can be extended to any length desired to accomplish this purpose.

I will now describe the mechanism for conveying the sand that has been used in the mold back to the molding-machine.

Directly under the hopper M' is a frame R, having rails *r* with turned-up ends *r'*.

R' is a screen-frame having wheels r^2, which travel on the rails *r*.

P' is a crank-shaft having cranks p^2, which are connected to studs r^3 on the screen-frame R' by rods P^2, so that as the shaft P' rotates a reciprocating motion will be imparted to the screen-frame R'. On the end of the shaft P' is a bevel-wheel p^3, which meshes with a bevel-pinion p^4 on the shaft *p* of the electric motor P. This electric motor is supported

by framework in any suitable manner. It will be noticed that as the screen-frame R′ reciprocates its rollers will travel upon the upturned ends r' of the rails r, thus lifting the frame first at one end and then at the other and jarring it in such a manner as to dislodge any sand which may be caught in the meshes of the screen, so that as the sand passes from the flasks through the bars m into the hopper M′ and from the hopper onto the screen R′ it will be thoroughly screened and the particles separated. Directly under the screen-frame R′ is a hopper Q, and the bottom of this hopper is closed by the carrying-run of an endless-belt conveyer S, which passes around a wheel s, having its bearing in the frame R and around a head wheel s'. The head wheel is mounted on a shaft s^2, geared to a motor S′ by worm-gearing.

S^2 is a hood, which is mounted directly over crushing-rolls T T, through which the sand is directed, so as to crush any lumps which may pass through the screen. Under the crushing-rolls is a hopper t, which is situated directly above an endless conveyer-belt V, which passes around rollers $v\,v'$, either one of which may be driven. Directly under the head roller v' of the belt V is a hopper V′, which directs the sand into a sand-mill W, driven by a motor W′. Water in suitable quantities is supplied by a pipe w. This mill is of the type in common use in foundries. The mill has a discharge-hopper W^2, which discharges the sand onto an endless conveyer-belt w', which passes around rollers w^2 w^3. The roller w^3 carries the sand into a hopper X which in turn discharges the sand into the boot z of a bucket elevator Z of the ordinary type. The hopper X is so situated as to receive the surplus sand from the molding-machine, being situated directly under the molding-machine, and as the sand is applied the surplus sand flows into the hopper. The bucket elevator Z discharges the sand into a hopper A′ above the molding-machine A, and I preferably provide a screen a, similar to the screen R′, which is reciprocated by the mechanism of the molding-machine. The sand does not accumulate in the hopper A′, but is sifted continuously from the hopper, so there is no liability of the sand being clogged in the hopper. In the drawings I have not shown a valve for controlling the flow of sand; but a valve may be used, if desired, when it is wished to shut down the feed of sand without stopping the conveying mechanism.

The operation of the machine is as follows: The operator stands in front of the molding-machine, and as the molding-machine is set in motion first one part of the flask is filled with sand, then rammed, and the surplus sand removed. Then a part of the flask is removed from the pattern and mounted on one of the platforms of the conveyer. The next part of the flask is then removed from its pattern and mounted above the other part, forming a complete flask. The platform conveyer is then intermittently moved forward, while the above operation is repeated. When the flask with the mold reaches the cupola-furnace, the metal is poured into the mold, the intermittent movement allowing sufficient time for the pouring operation. The flask is then carried sufficiently beyond the cupola to allow the metal to set, so that it can be removed from the mold. At this point the frame conveyer carries the flask off to one side of the platform conveyer and over the agitating mechanism. As the bottom board of the flask is not supported at this point it falls, and the sand and metal are discharged from the flask and fall onto the grating M, the sand passing through the grating and the metal passing to one side. The flask is then conveyed by the frame conveyer to a point in close proximity to the molding-machine, where it is removed by the operator from the frame conveyer and again rammed with sand. The sand discharged through the screens M is passed through rollers, so as to crush any lumps that may form, then passed through a mill of the type commonly used in foundries and moistened sufficiently so that it will be in proper condition to be used again in making a mold. It is then elevated to the hopper above the molding-machine and sifted directly onto the pattern in a part of the flask, the surplus sand flowing back to the boot of the elevator.

It will be seen that by this construction I am enabled to provide means for readily conveying the flasks from the mold to the cupola and to separate the metal from the sand of the mold, returning both the sand and the flasks to the molding-machine.

I claim as my invention—

1. The combination of a conveyer having a series of platforms, a second conveyer having a series of frames to pass over the platform conveyer and traveling with it, with flasks arranged to be carried by the platforms, substantially as described.

2. The combination of a platform conveyer, a frame conveyer, one arranged to travel in planes at right angles to the other, the frame conveyer traveling over the platform conveyer, with flasks carried first by the platform conveyer and then by the frame conveyer, substantially as described.

3. The combination of an endless vertically-arranged conveyer, consisting of a series of enchained platforms, an endless horizontal conveyer consisting of a series of enchained frames, a portion of the horizontal conveyer extending oyer the carrying-run of the platform conveyer and arranged to travel at the same speed, flasks mounted within the frames and having bottoms supported by the platforms during the time the

flasks are passing from the molding-point to the metal-pouring point and arranged to drop when the frames of the horizontally-arranged conveyer pass to one side of the platform, substantially as described.

4. The combination of a vertically-arranged conveyer having enchained platforms, a horizontally-arranged conveyer having enchained frames for the reception of the flasks, means for driving one conveyer, and couplings between the frames and platforms through which the other conveyer is driven, substantially as described.

5. The combination of a platform conveyer, a frame conveyer arranged above the platform conveyer and moving with it, with means for agitating the frames after they pass away from the platform conveyer whereby the sand is dislodged from the flasks carried by the frames, substantially as described.

6. The combination of a platform conveyer, a frame conveyer traveling over the platform conveyer in a horizontal plane, rails for carrying the frame conveyer after it leaves the platform conveyer, and means for agitating a section of said rails so as to agitate the frame to dislodge the sand from the flasks carried by the frames, substantially as described.

7. The combination of a platform conveyer traveling in a vertical plane, a frame conveyer traveling in a horizontal plane, means for driving the platform conveyer, lugs on each frame entering recesses in the platforms whereby the frame conveyer is driven by the platform conveyer, substantially as described.

8. The combination of a platform conveyer, a frame conveyer supported by the platform conveyer on the carrying-run, said frames being coupled together by links so formed that each frame will have freedom to move up and down to a limited extent, substantially as described.

9. The combination of a platform conveyer, a frame conveyer, a flask within each frame, each flask having a bottom board hinged thereto and supported by a platform while on the carrying-run, substantially as described.

10. The combination of a platform conveyer, a frame conveyer, a flask carried by each frame, each flask having a bottom board with a double hinge by which the bottom board is secured to the flask, the said bottom board being supported by the platform on the carrying-run, and when free of the platform, being adapted to swing clear of the flask so as to allow for the discharge of all the sand from the flasks, substantially as described.

11. The combination of a platform conveyer, a frame conveyer arranged to receive flasks, said frame conveyer being arranged to travel in a horizontal plane, a screen for receiving the sand and casting after the frames move away from the platforms, a screen for screening the sand, crushing-rolls, an endless belt leading from the screen to the crushing-rolls, a sand-mixer, an endless belt leading from the crushing-rolls to the sand-mixer, a bucket elevator, an endless belt leading from the mixer and discharging into the boot of the elevator, and a screen at the molding-machine into which the sand is discharged, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWIN E. WAITE.

Witnesses:
WILL A. BARR,
JOS. H. KLEIN.