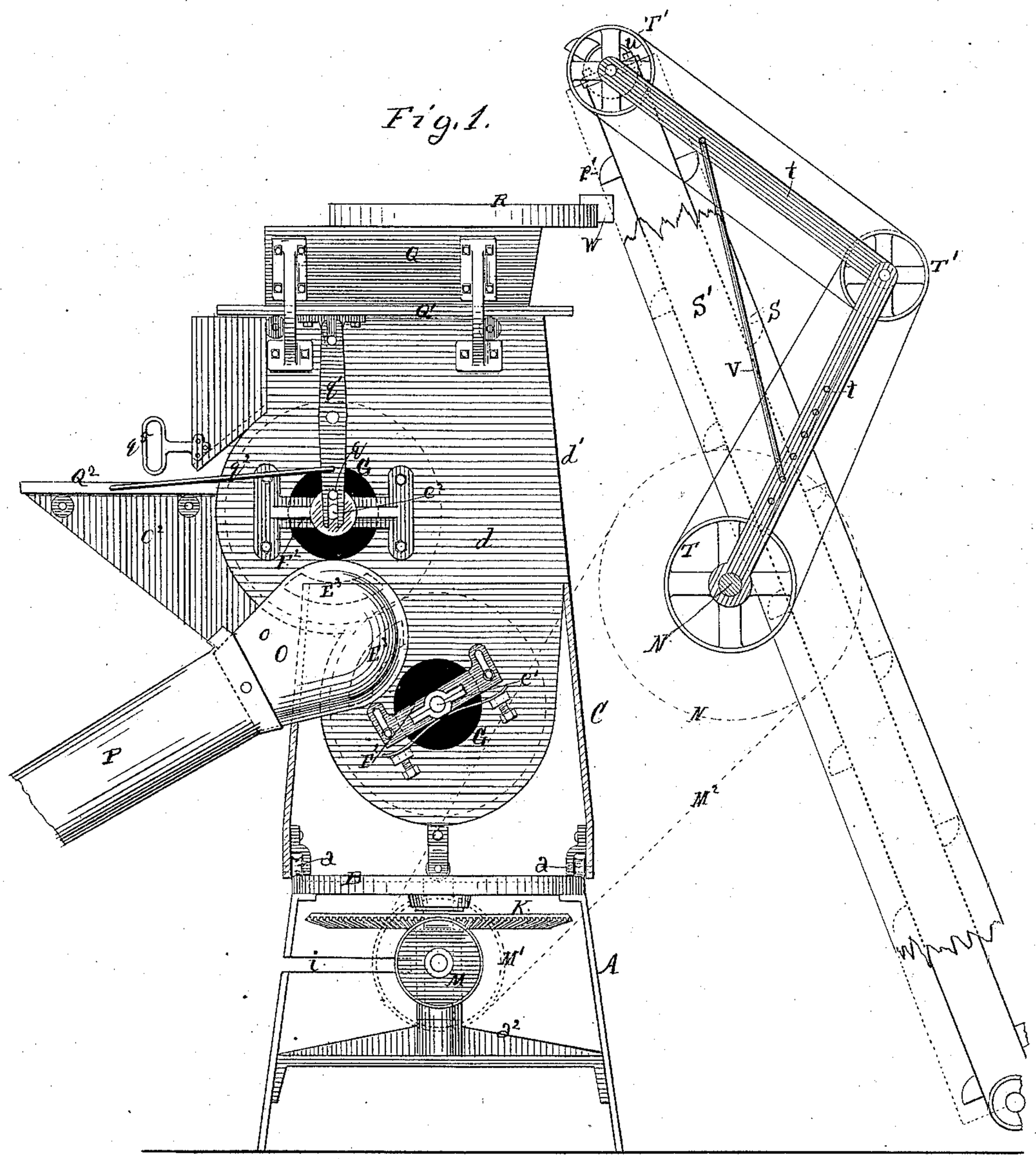
(No Model.) 4 Sheets—Sheet 1.

W. DOYLE.

SAND MOLDING MACHINE FOR RUNNING RIDDLED SAND INTO MOLDS FOR CASTING.

No. 312,983. Patented Feb. 24, 1885.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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SAND MOLDING MACHINE FOR RUNNING RIDDLED SAND INTO MOLDS FOR CASTING.

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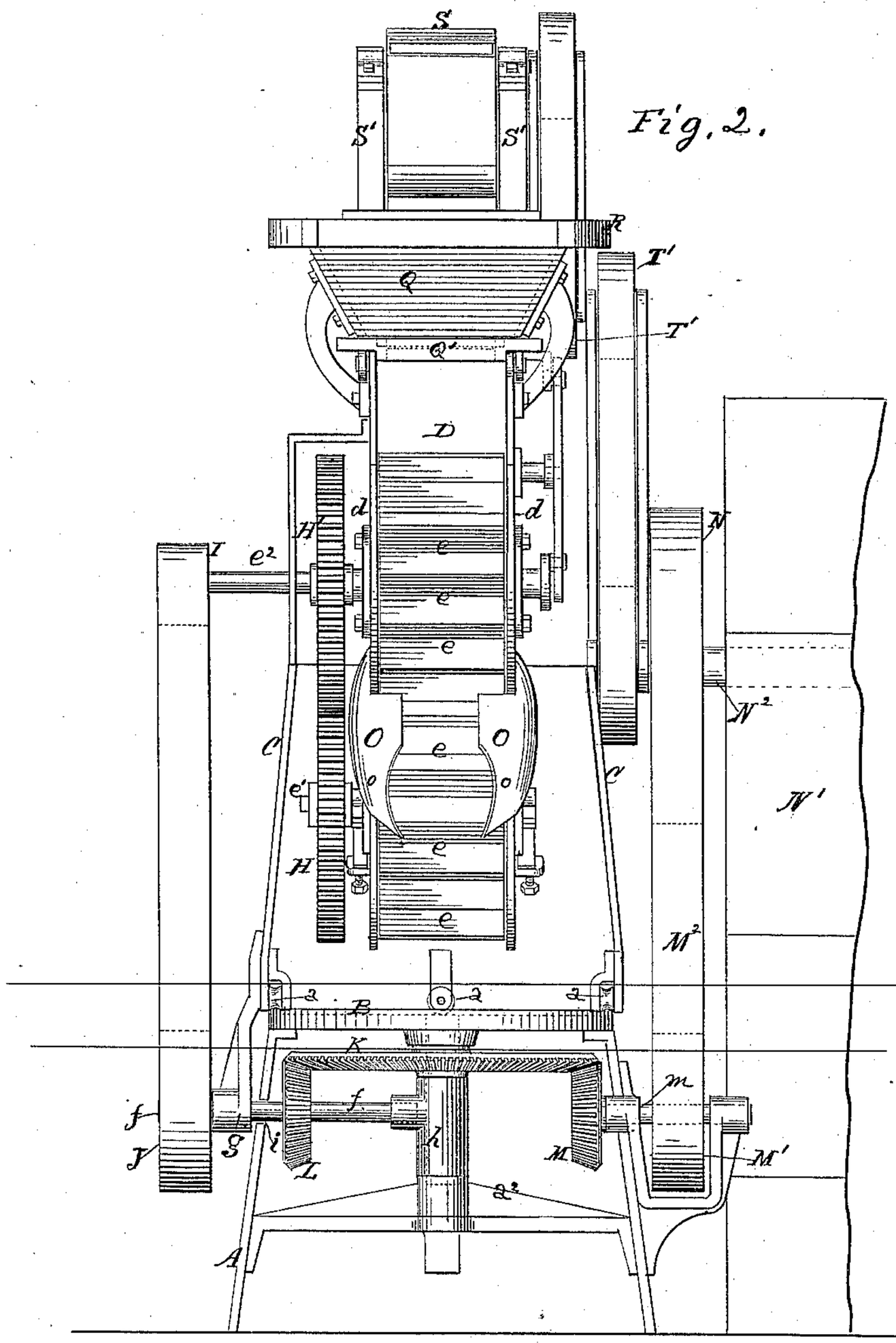

Fig. 2.

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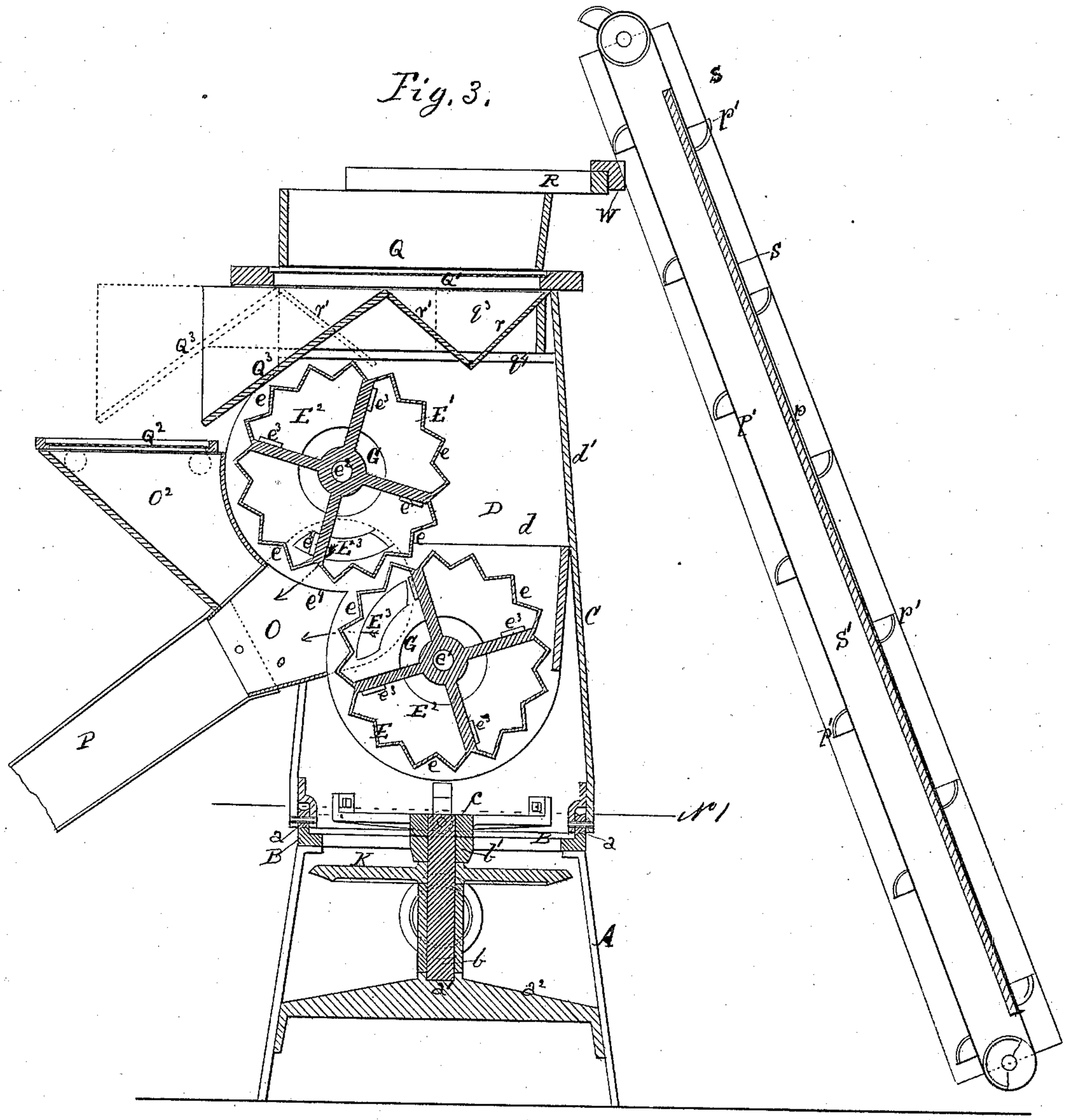
SAND MOLDING MACHINE FOR RUNNING RIDDLED SAND INTO MOLDS FOR CASTING.

No. 312,983. Patented Feb. 24, 1885.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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SAND MOLDING MACHINE FOR RUNNING RIDDLED SAND INTO MOLDS FOR CASTING.

No. 312,983. Patented Feb. 24, 1885.

Fig. 4.

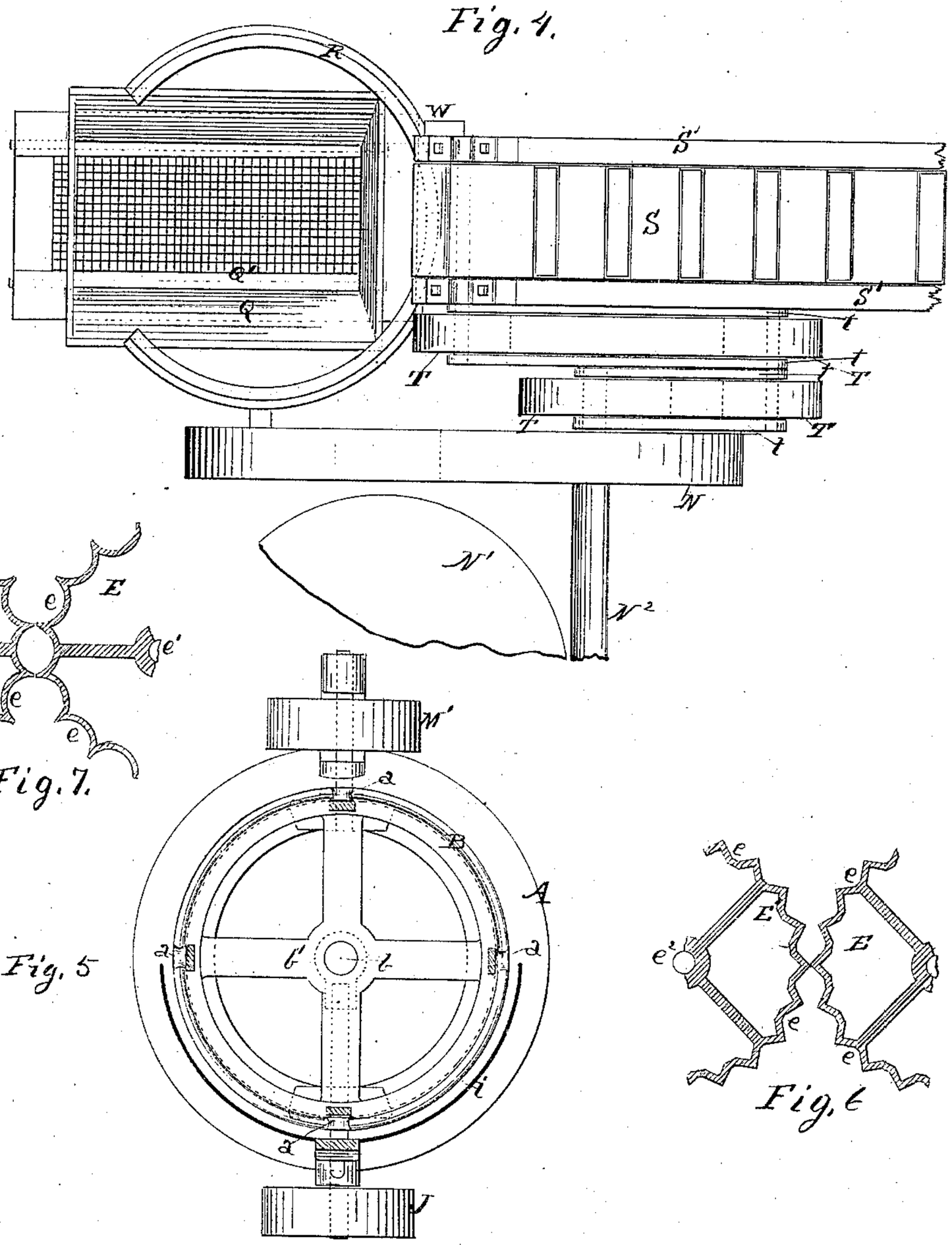

Fig. 7.

Fig. 5

Fig. 6

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UNITED STATES PATENT OFFICE.

WILLIAM DOYLE, OF ALBANY, NEW YORK.

SAND-MOLDING MACHINE FOR RUNNING RIDDLED SAND INTO MOLDS FOR CASTING.

SPECIFICATION forming part of Letters Patent No. 312,983, dated February 24, 1885.

Application filed October 27, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM DOYLE, a citizen of the United States, residing in the city and county of Albany, and State of New York, have invented a new and Improved Mold-Filling Machine for Running Riddled Sand into Molds for Castings, of which the following is a specification.

My invention relates to a machine which will riddle molding-sand and introduce it with great force into the molds, and be so under the control of the operator that he may direct the passage of sand from the machine to different molds in the neighborhood of the machine; and it consists in the combinations of elements and devices, hereinafter particularly described, and set forth in the claims.

The objects of my invention are, primarily, to provide a machine which will be operated by any convenient power, and automatically carry the sand from the heap to a riddle, to be properly loosened up, and subsequently be carried by proper drums into a sand-hose, from which sand will be introduced into the molds under a force which will obviate the necessity of ramming the molds, and thereby save the molder the labor of shoveling and ramming now required to fill and ram the molds; secondly, to provide mechanism by which the sand will be carried from the sand-heap to a riddle, to be broken and loosened up, and then forcibly ejected into the mold. I attain these objects by the means illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my new machine, with casings of parts thereof shown in section. Fig. 2 is a front elevation of the same. Fig. 3 is a sectional elevation. Fig. 4 is a horizontal view from above. Fig. 5 is a horizontal view from above taken at line No. 1 in Fig. 3. Figs. 6 and 7 illustrate modifications of the form and relative adjustments of the sand-ejecting drums which may be employed.

The same letters of reference refer to like parts throughout the several views.

A represents a stationary base-support, which may be made with any proper form, and of wood or iron, or both combined. In the drawings, Fig. 5, this base portion of the structure is shown to be circular, so as to inclose the operating mechanism from which the machine is driven.

B is a circular track secured to the upper end of base A, upon which track the machine proper is mounted, so as to be readily revolved horizontally in either direction.

C is the case (or frame-work) of the machine proper. This case or frame has secured to its lower end rollers *a a*, working on track B, and is held from shifting by means of central vertical shaft, *b*, connected at its upper end with a cross-bracket bearing, *c*, secured to frame C, and working through cross-bar *b'*, secured to base A, and resting in step *a'*, made in cross-bar a^2, as shown. This case C, thus provided with rollers *a* and pivoted with vertical shaft *b*, can be readily moved horizontally in either direction in relation to the base of the machine.

D is the sand-chamber, formed between the side walls, *d d*, and rear side walls, *d'*. The outline of the side walls, *d*, are substantially shown in Fig. 1. The body containing chamber D is supported in the case (or frame) C, to which it is properly secured, so as to be moved with said case (or frame) as the latter may be turned.

E and E' are revolving drums, having each a corrugated periphery, in which the corrugations *e e* are arranged in each so as to run horizontally from one end to the other in direction parallel with the axis of said drums. These drums with their corrugated periphery can be made of cast metal or of sheet metal, as may be preferred, and the corrugations *e e* in both drums are made to be external and internal in character, as shown. The drum E is mounted by means of arms on horizontal shaft *e'* in the lower portion of chamber D and freely revolves between the sides *d d*. The drum E' is mounted by means of similar arms on horizontal shaft e^2 in the forward upper portion of said chamber and revolves between sides *d d*. The corrugations *e* of these drums may be in the form shown in Fig. 3, or in that shown in modifications in Figs. 6 and 7, and these drums may be so set and arranged in relation to each other that the crest of the corrugations of each drum will project to a short distance into the re-entering angle of the corrugations of the other as the two are revolved, as illustrated in Fig. 3, or be so adjusted in relation to each other that the crests of each will be opposite to those of

the other when revolved, as illustrated in Figs. 6 and 7. The shafts *e* and *e'* of these drums E E' are supported in proper bearings F, secured to the sides *d d* of chamber D. The bearings F are shown to have elastic support from sides *d* for the lower drum, though the bearings of both drums may have such elastic support. When these drums are driven by a band and a pulley secured to the shaft *e'* of the lower drum, the elastically-supported bearing should be applied to the shaft of the lower drum. By means of the elastic bearings the drums will yield apart from each other when pieces of metal or stone accidentally mixed in with the sand are being passed through between the drums.

G G, Figs. 1 and 3, are openings made in the side walls, *d d*, opposite to and relatively central with the chamber E^2 of said drums. These openings are for the admission of air to the interior of drums E E' as they are revolved.

H H' are gear-wheels, which gear drums E E' together so that they will be positively and simultaneously revolved within sand-chamber D. Motion is communicated to gear H' of drum E' by means of pulley I, secured to shaft e^2 of said gear and drum, driven by a band from pulley J, secured to shaft *f*.

K is a bevel-gear mounted loosely on vertical shaft *b*, inclosed within base A.

L is a bevel-gear secured to horizontal shaft *f*, and actuated by bevel-gear K. This bevel-gear L is supported in proper bearings, one being made with bracket *g*, secured to frame C, and the other with loose vertical sleeve *h*, on vertical shaft *b*. When case A is made with a round shell-like form, there is provided in its side a horizontal slot, *i*, through which shaft *f* will pass, and into which it may freely move when the upper portion of the structure, together with this shaft and its connected pulley J and bevel-gear L, is turned or partly revolved in either direction from shaft *b*.

M is a bevel-gear mounted on horizontal shaft *m*, supported in proper bearings secured to the stationary base or frame A.

Secured to shaft *m* is band-wheel M', which is actuated by band M^2, driven from any proper motor. In the drawings this band-wheel M' is shown to be driven by the fly-wheel N of engine N', (a section of the engine-boiler and fly-wheel shaft N^2 being shown in the drawings.) The wheel N being revolved, will communicate motion to bevel-gear M through band M^2 and wheel M', when gear M will actuate bevel-gear K, which gear will revolve bevel-gear L, and cause pulley J to drive pulley I, and thereby revolve drum E' and gear H', when the latter will give motion to gear H, and thereby revolve drum E.

It will be readily understood that in whatever direction the frame C and the mechanism connected with it may be turned, (on its central pivotal shaft, *b*, and supporting-rollers *a a*,) the shaft *f*, gear L, and pulley J will move with the same without in the least affecting bevel-gears K and M or changing the relative arrangement of shaft *m* of gear M and pulley M' with shaft N^2 of wheel N. It will therefore be seen that the entire structure above the circular way or track B may be turned in either direction to about a quarter of a revolution, or to the distance limited by the length of slot *i* in base A, while the engine is driving bevel-gear K through gear M, pulley M', and band M^2, and that bevel-gear K will at the same time give motion through gear I to the operative mechanism in the structure above base A, and cause drums E E' to revolve continuously. Secured to the arms connecting these drums with their respective shafts *e'* are fan-bars e^3 e^3, which in some cases can be employed to advantage as fans. Openings E^3 E^3 are made in sides *d d* and within the line of the inner circumference of the drums E E'. Through these openings the air drawn into the chamber of the revolving drums through openings G G will readily pass out to escape through the passage-way e^4 between sides *d* and the walls of the sectional spout O, as indicated by arrow 1. This spout O is formed of sections *o o*, made each with a concave chamber on its inner side and firmly secured to side pieces, *d*, with their rearward portions covering over openings E^3. The forwardly-projected ends of these sections together form a nozzle, with which a proper sand-hose, P, is to be connected.

Q is a hopper, mounted at the upper end of chamber D, and provided at its bottom with a sieve or riddle, Q'. This hopper is supported clear of the side pieces, *d*, by proper brackets, and the sieve or riddle is operated in a reciprocating manner by any proper mechanism, preference being given to that shown, which consists of crank *q*, connected with shaft e^2 of drum E', vibrating lever *q'*, pivoted to a side, *d*, and operating with a pin connected with the sieve Q'.

R is a circular rim secured to the upper edge portions of hopper Q. This circular rim in its attachment to hopper Q is so arranged that the center of the circle of said rim will be relatively coincident with the center of the vertical shaft *b*, on which the upper structure can turn so as to form a circular track, from which the upper end of the sand-elevator will be supported.

S is an elevator, which is shown to consist of an endless belt, *p*, provided at intervals with buckets *p'*. This endless belt is carried by proper pulleys supported in proper brackets secured to a proper frame-work, S', and is driven by any proper or convenient power. It is intended that this elevator will be adapted to have its lower end moved outward from the machine into which it feeds the sand so as to take sand from a heap by commencing at near the machine and working outward, the foot of the elevator being moved outward from time to time as may be required. The driving apparatus of this elevator is shown to consist of a pulley, T, secured to shaft N^2 of fly-wheel

N, band-pulleys T′ T′, carried by jointed arms *t t*, which are jointed below with shaft N^2 and above with the shaft of the upper pulley, *u*, of the endless belt *p*, carrying buckets. These jointed arms are securely held at any necessary angle by any proper device—as, for instance, the holding-bar V, engaging and connecting with both arms.

W is a supporting-piece between the upper end of the elevator-frame S′ and circular rim R. This supporting-piece bears on said rim, but is not secured to the same, and allows the machine proper to be readily turned in either direction while the elevator is being operated, and also allows the elevator to be moved outward or inward in relation to base A of the machine.

Q^2 is a facing sand sieve, which is preferably located below riddle Q′, and relatively forward of upper drum, E′, and over hopper O^2, which communicates with spout O. This sieve is shown to be operated with a reciprocating movement by means of connecting-rod q^2 between vibrating lever *q′* and sieve Q^2. Any other well-known means can be employed to operate this sieve.

Q^3, Fig. 3, is an inclined sand-board secured to side pieces, q^3, which are supported on ways or cleats q^4, secured to the inner side surface of walls *d*. This said board can be moved forward at will to position of dotted lines in Fig. 3, so that no sand falling through riddle Q will escape falling on it. A handle or handles, q^5, is secured to the side pieces of this board for convenience in moving the board rearward and forward, as may be required. When this board is moved back to position shown by full lines in Fig. 3, a small quantity of sand from riddle Q will be conducted by it to the sieve Q^2 and be sifted down to enter spout O.

The corrugations in drums E E′ can be made with any of the forms illustrated, and the drums be set to bring these corrugations in relation to each other as shown in Fig. 3 or as illustrated in Figs. 6 and 7. When set as shown in Fig. 3, the sand will be passed from between the drums as in a continuous crimped form, and when set as shown in Figs. 6 and 7 the sand will be discharged in detached block form, which will be broken in its passage into the spout and through the hose, while the air-blast will mingle with the particles of sand and cause the same to be ejected with great force into the mold.

The machine and engine can both be mounted on a single platform, which is provided with wheels running on a track occupying the floor on which the sand is heaped, in which case the machine will be first started at the forward end of the heap and be gradually moved back by successive steps as the heap of sand is removed by the elevator.

If preferred, other systems of gear-wheels and band-wheels than that shown may be employed to operate the drums, sieves, and elevator from permanent shaftings in the building. In such a case the machine should be stationary and the sand be carried to the elevator.

The advantageous result obtained by the use of the above-described machine is the relief of the molder of the heavy work, such as riddling and shoveling the sand and ramming the same. It is to be understood the molder will be required in all cases to dress the mold in the usual manner and perform the other manipulations incidental to molding for casting.

The manner in which this machine is operated is as follows: Motion is communicated to the sand-elevating mechanism and to the drums E E′ simultaneously by the gear and band wheel mechanism provided, when the buckets of the elevator will carry the sand from the heap to the hopper of the machine, and, as the drums E E′ are revolved, mechanism provided for shaking the riddle or sieve Q′ will operate the same so as to riddle the sand as fast as it is introduced into the hopper. The sand dropping down from the riddle will fall into chamber D and will be acted upon by the rapidly-revolved drums E E′, which will revolve simultaneously and cause their external corrugations to gather the sand and carry it in a rapid manner from chamber D forward to a discharge into spout O, as indicated by arrows, from whence the sand will be conducted by any proper sand-hose, P, and discharged into the mold to be filled and be packed therein. At the same time the external series of corrugations of the drums are operating with the sand, the internal corrugations of the same will operate as fans for drawing external air through openings G G into the chambers of said drums, and forcing the same out through openings E^3 E^3 into passage-ways e^4, between the sections of spout O and side wall, *d*, so that there will be produced a continuous blast of air from the machine into spout O and through hose P at the same time the corrugations of the drums are throwing the same forward in the spout. This blast of air, together with the forcible forward ejectment of the sand from the drums, will cause the sand to be discharged with great rapidity and force into any molds discharged into and rapidly fill the same, while the force of the discharge will pack the sand so as not to require any ramming of the sand, as heretofore required in the old method of filling the molds. The horizontal rotary movement of the upper portion of the machine on its base A permits an operator to readily direct the discharge of the sand into molds which are arranged at each side of the machine and in front of the same, and within reach of hose P, so that the operator can readily discharge the sand into several neighboring molds successively at each side of the machine.

The facing sand sieve Q^2 is to be used only to discharge a small quantity of fine sand into the mold and on the pattern within preparatory to filling the mold with sand passed

only through riddle Q'. When this fine sand is to be discharged into the mold, the operator will, by means of handle q^5, move board Q^3 back to position shown by full lines in Fig. 3, when a small portion of sand from the riddle will be conducted to sieve Q^2 and be sifted into hopper O^2, and conducted into spout O, to be discharged through hose P into the mold and on the face of the pattern therein. This use of the facing sand sieve Q^2 will be only for a moment, when the sand-board will be drawn forward. When sand-board Q^3 is moved back, stop-board r within chamber D and board r', secured with sides q^3, and sand-board Q^3 will prevent the sand from riddle Q' from falling down in chamber D to revolving drums E E', and when board Q is drawn forward the sand from the riddle will freely fall into said chamber.

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

1. In a machine for filling and packing foundry-sand into molds, the combination, with a sand-chamber, of revolving corrugated drums, a spout into which the sand is discharged, and mechanism for revolving the said drums in opposite directions for mutual operations to carry the sand from the said chamber into the discharge-spout, substantially as and for the purposes set forth.

2. In a machine for filling and packing sand into molds, the combination, with revolving chambered drums which are provided with external and internal corrugations and revolving between the sides of a sand-containing chamber, of openings through said sides to the interior of said drum-chamber for admission of outside air, and exit-openings for the discharge of air into a spout arranged in front of the neighboring portions of said drums, substantially as and for the purposes set forth.

3. The combination, with chambered drums E E', having each a series of external corrugations, which are unitedly adapted to carry sand from a sand-containing chamber, and a spout arranged opposite the neighboring portions of said drums, of a casing having air-inlet openings which admit air to the interior of said drums, and exit-openings which communicate from the chambers of said drums to passage-ways along the inner sides of the spout, and corrugations and fan-bars arranged within the chambers of said drums so as to revolve with the same, substantially as and for the purposes set forth.

4. In a machine for filling and packing molds with sand, the combination, with a sand-containing chamber, and a pair of revolving drums which are corrugated on their periphery so as to adapt them to carry sand from said chamber to a discharge-spout, of mechanism for driving an air blast or current into the sand-spout at the same time sand is being discharged from the same by the operations of the revolving drums, substantially as and for the purposes set forth.

5. In a machine for filling and packing sand into molds, the combination, with a reciprocating riddle, a pair of revolving corrugated drums, and a revolving fan, of a casing having openings E^3 E^3, spout O, and hose P, substantially as and for the purposes set forth.

6. In a machine for filling and packing sand into molds, the combination, with a structure which contains a chamber, revolving corrugated drums, an air-blowing mechanism, and discharge-spout, and which supports a reciprocating riddle, and which are adapted to be together turned horizontally in either direction, of a base frame or support which is stationary, and gear mechanism supported by said stationary frame or base coacting with mechanism supported from the sides of the movable structure above, and communicating motion to said drums and air-blowing mechanism and riddle, substantially as and for the purposes set forth.

7. In a machine for discharging sand into molds, the combination, with revolving drums and an air-blast, of hose P, connected with spout O, substantially as and for the purposes set forth.

8. In a machine for filling and packing sand into molds, the combination, with the structure containing the revolving drums, of hopper O and reciprocating riddle Q', substantially as and for the purposes set forth.

9. The combination, with hopper Q, reciprocating riddle Q', and a structure which contains an air-blowing mechanism, of the sieve Q^2, adapted to be operated in a reciprocating manner by mechanism, movable inclined sand-board Q^3, and conducts O^2, communicating with spout O, through which the air-blast is driven, substantially as and for the purposes set forth.

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