

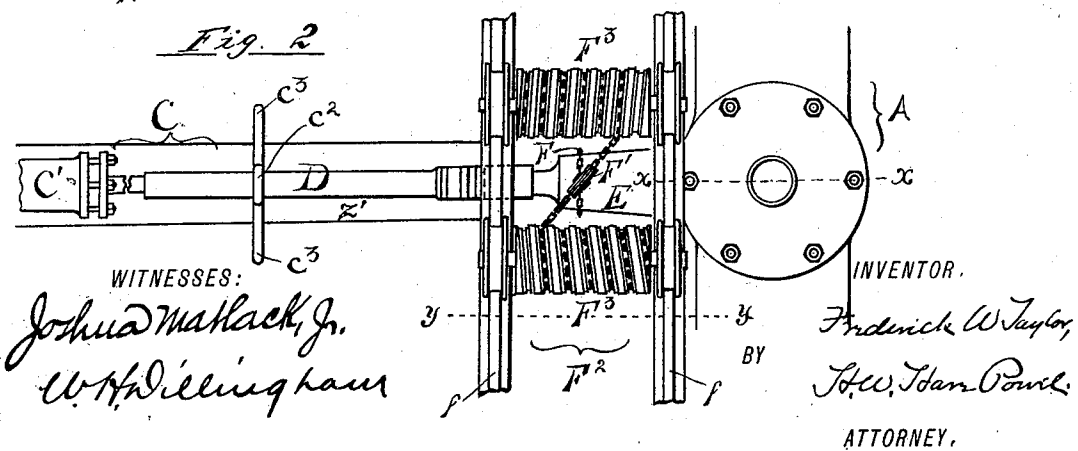
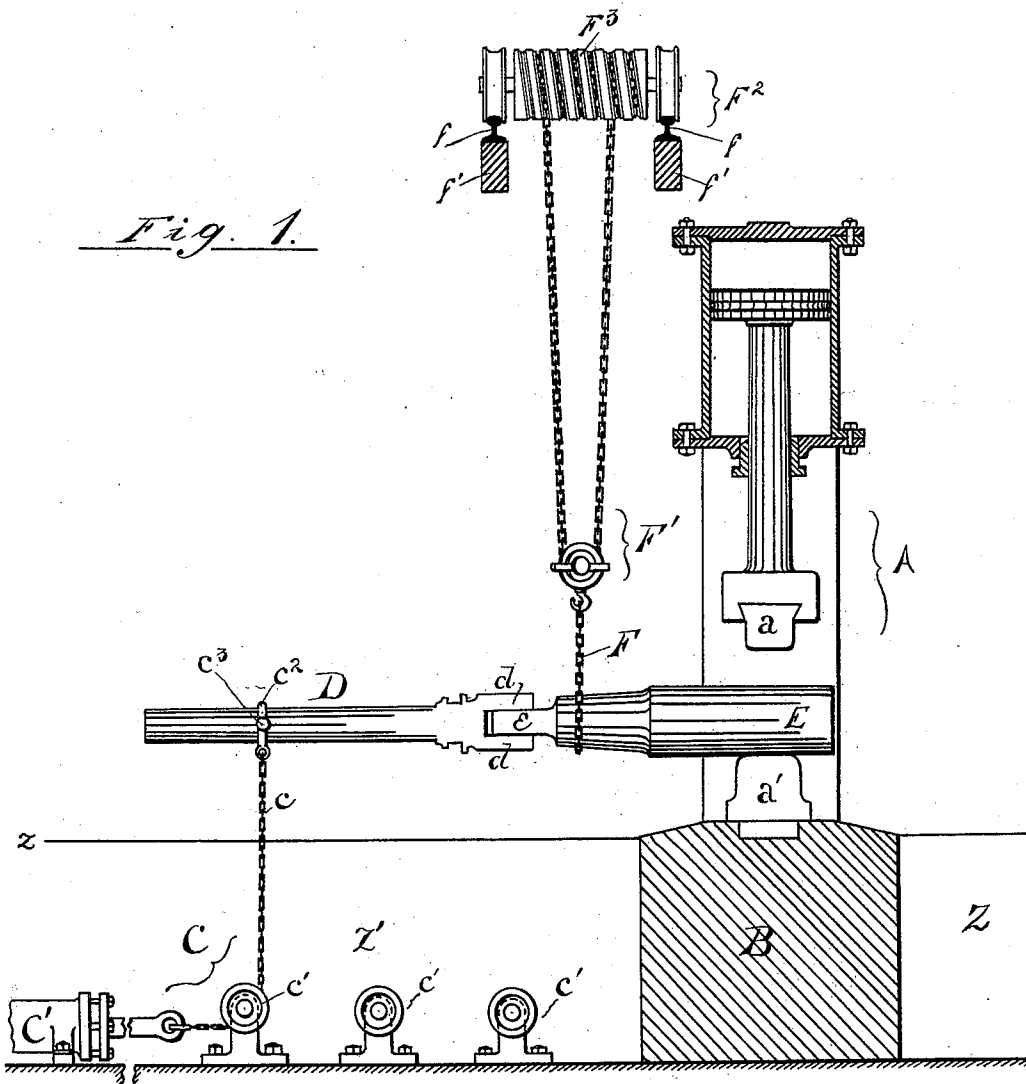
(No Model.)

5 Sheets—Sheet 1.

F. W. TAYLOR.
FORGING MECHANISM.

No. 400,143.

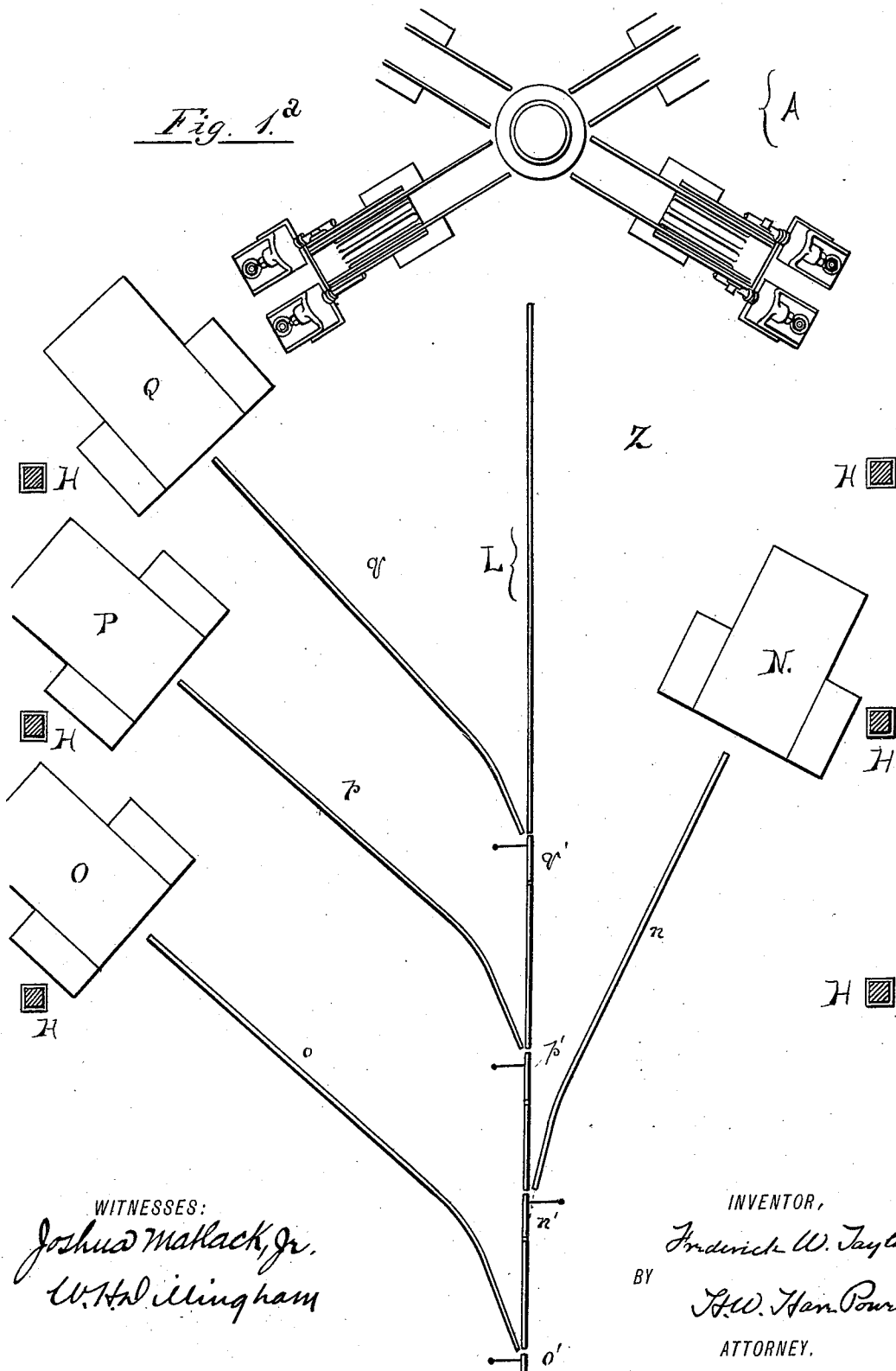
Patented Mar. 26, 1889.



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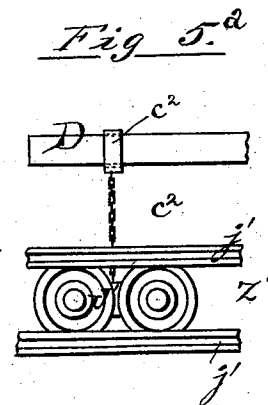
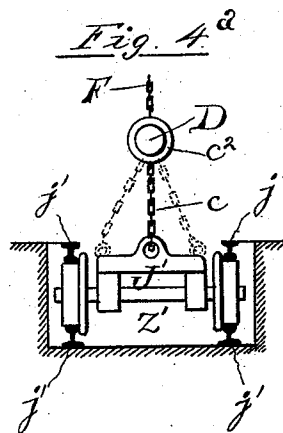
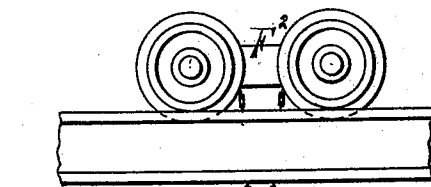
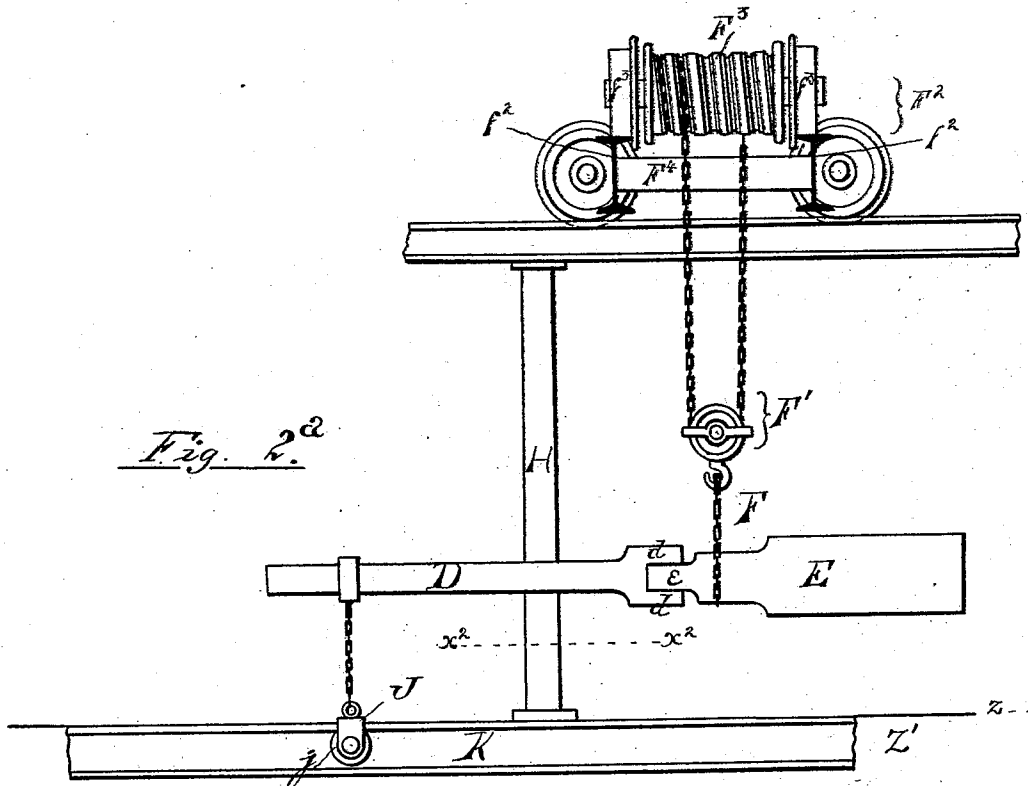
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WITNESSES:

Joshua M. Mack, Jr.
W. H. Willingham

INVENTOR,
Frederick W. Taylor,

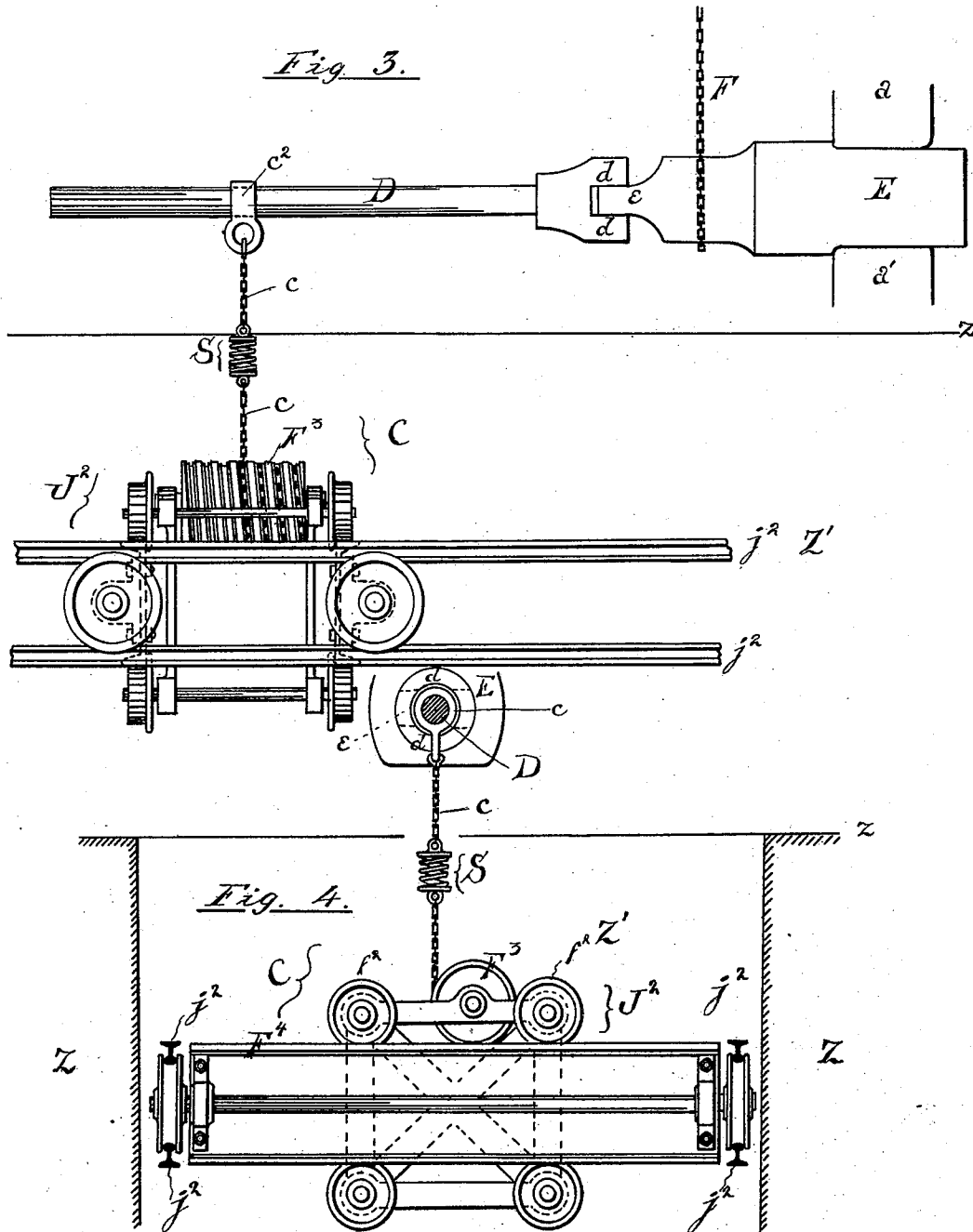
BY
H. W. Van Poutre,

ATTORNEY.

F. W. TAYLOR.
FORGING MECHANISM.

No. 400,143.

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WITNESSES:

Joshua M. Mack, Jr.
W. H. Dillingham

INVENTOR,

Fredrick W. Taylor,

BY

H. W. Ham Pond

ATTORNEY.

F. W. TAYLOR.
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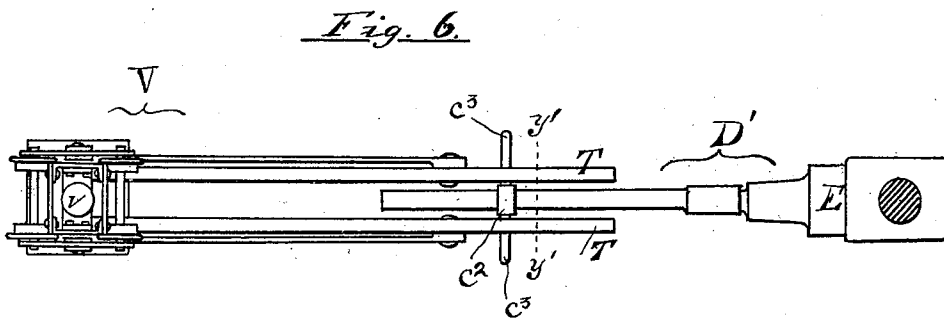
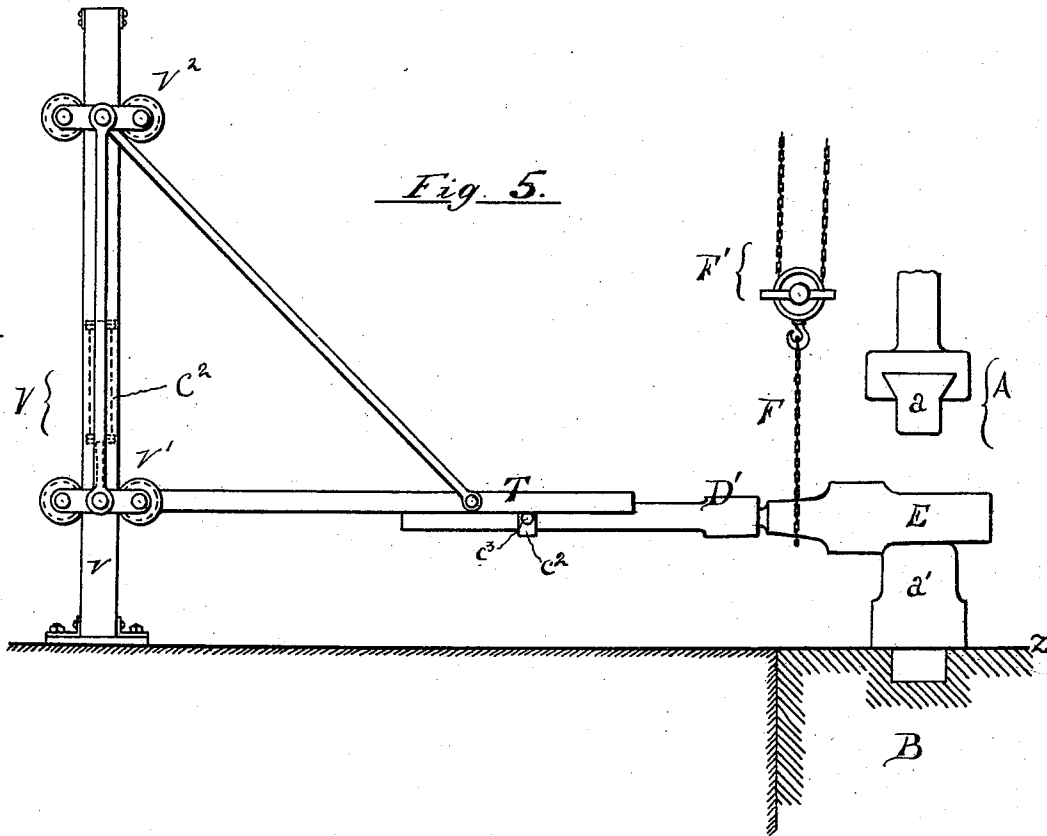
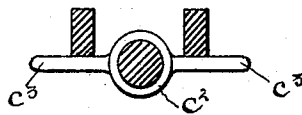


Fig. 7

WITNESSES:
Joshua M. Mack, Jr.
W. H. Willingham



INVENTOR,
Fredrick W. Taylor,
by his atty,
H. W. Ham. Powell.

UNITED STATES PATENT OFFICE.

FREDERICK W. TAYLOR, OF PHILADELPHIA, PENNSYLVANIA.

FORGING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 400,143, dated March 26, 1889.

Application filed February 5, 1889. Serial No. 298,727. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. TAYLOR, of the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Forging Mechanisms; and I do hereby declare that the following is a full, clear, and exact description of the same.

Heretofore in transferring forgings of considerable size between the fire and the smithing-tools hoisting and traveling devices—such as cranes, shears, gins, &c.—in great variety of forms have been employed, and “porters” or long bars of iron have been attached to and in continuation of the axis of the forging, which is then technically called a “use,” whereby it may, when suspended on the crane, &c., be guided to and localized between the dies of the steam-hammer, the tail or handle of the “porter-bar,” which is frequently equipped with a cross-lever, being the means by which the foremen maneuver the suspended mass. In some cases, however, instead of a separate piece, the practice is to fashion the porter bar from and have it integral with the work operated on; or, in still other cases, the porter-bar consists of the stock of material out of which the work in contemplation is to be produced without giving that stock any particular form; and, in general, the common method of procedure with these devices has been, for the purpose of transferring the forging or use to and fro between the fire and the hammer, to suspend it and its attached or integral porter-bar in a balancing condition from the fall of the crane, &c., and by moving or traveling the suspensory mechanism to effect such change of place as is necessary. Then, after a heat has been taken and the suspended mass brought in such balanced condition to the hammer, the practice has been, by shifting the sling or moving a counterpoising-weight, to cause a preponderating of the use or heated end, this preponderance serving to maintain the work upon the anvil in such position as the foremen by laying hold of and weighing down upon the tail end of the porter-bar as a maneuvering-lever may locate it in, the withdrawal from the hammer for reheating, &c., being usually accomplished by re-establishing an equilibrium and retreating the crane, &c.

Now, my present invention relates to an im-

proved and novel forging mechanism by which such forgings may be attached, slung, guided, and controlled not only in the act of withdrawal from and return to the fire, but also and especially at and during the localizing and maneuvering of the use or work beneath the steam-hammer, its chief objects being to substitute for the skilled and disciplined labor required of the smith or foremen by the old method of doing these things mechanical devices whereby the whole operation may be under the control of, perhaps, the smith alone, and so insure an accuracy and efficiency of action with a promptness or response to the smith's wishes in conducting the forging operation which it is otherwise almost, if not quite, impossible to attain. Moreover, my present invention removes in practice an element of danger to the hammer and work, as well as of risk to human life and limb, which the customary method of employing men to lay hold of and control the free end of the porter-bar heretofore entailed. For the shock and tingling in the hand and arm of the blacksmith should he strike a misdirected blow with a hand-hammer or not seat his work properly upon his anvil, are, even with the use of a sledge, increased into violent and dangerous movements; but when they come from foul blows delivered by the ponderous power-hammers of to-day they are increased into titanic forces, which, possibly at a single stroke, produce most disastrous accidents to property, life, and limb. Otherwise, by the jar and vibration, with the consequent crystallizing of metals and the loosening of bolts and joints, which the liability for misapplication incident to the manual localizing of the use within the hammer's range of action produces, there is occasioned a slower but an acknowledged and insidious deterioration of the mechanism subjected to them; and those who are familiar with steam-hammers are well aware that a frequent accident and interruption of their working is caused by the intense vibrations of a foul blow loosening and shaking off porter-bars of the separate sort from their attachment to the forging or use.

Now, my invention, broadly speaking, consists in dispensing with the condition of equilibrium usually established in the suspended forging for its transfers and in place thereof

effecting, as it were, a floating of the mass; also in mechanically controlling not only the levels, but also the tilting or vibrations of said floating mass as need be during the forging operations, and in devising mechanism for carrying these effects into practice. In general the devices which I have found to accomplish these ends best comprise, in conjunction with the ordinary forging-plant, a suspending device proper—such as the aforesaid crane, upon which the forging or porter-bar provided use is slung, and fulcrumed with a normal tendency to preponderate in the portion about to be hammered—and a tilting device, which, acting in opposition to such gravitative effect, serves, as desired, to restrain or overcome it, the whole being so combined and contrived that a release at a proper time by the tilting device will permit gravity to act for seating the work upon the anvil. Moreover, I prefer that this tilting device should be an ambulatory down-haul, working from below, substantially as the inverted counterpart to an ordinary overhead traveling crane; but, without departing from the purview of this invention, the tilting device may be modified in many respects—for example, it may be a mechanism adapted merely to pay out and haul down by turns on the forging, or even consist of a fixed shackle or bridle with which the porter-bar can be engaged, and then the vibration or other movements of the floating mass can be produced by simply lifting or traveling the crane or other suspending device; but reference being now had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts throughout the figures, they will be found to illustrate my novel forging mechanism as follows, to wit:

Figure 1 shows in side elevation and partly in section simple forms of the suspending and tilting devices in the act of applying a use to the dies of a steam-hammer; Fig. 2, a plan view of the structures illustrated in Fig. 1, broken lines $x x$ and $y y$ respectively denoting planes on which the sections of Fig. 1 are taken; Figs. 3 and 4, side elevations and end views, respectively, of the preferred form of tilting device, it being here illustrated as ambulatory and capable of traversing sidewise as well as longitudinally, Figs. 5, 6, and 7 being, respectively, side elevation, plan view, and cross-sectional detail (the latter taken on the broken lines $y' y'$ of Fig. 6) of a modification. Figs. 1^a to 5^a, inclusive, comprise a series of views illustrative of a railway system ranging to considerable distances about the shop. Of these, Fig. 1^a is a general plan view, which, being taken from below the level of an overhead traveling bridge-crane, merely indicates said crane's position and range by the cross-section of its piers. Fig. 2^a gives side elevation of a portion of this system on a considerably larger scale, the broken lines $x^2 x^2$ indicating that on which the sections

through the piers in Fig. 1^a are taken, the suspending and tilting devices being here represented in the act of floating and traversing a porter-bar-provided use in a substantially level position. Fig. 3^a is a fragmentary view taken endwise and from left of the device shown in Fig. 2^a; and Figs. 4^a and 5^a, respectively, endwise and side elevations of a double-track modification of the tilting device's railway.

In general, in these views an ordinary steam-hammer, A, whereof $a a'$ are respectively its hammer and anvil dies, is located and secured about its anvil-base B in the usual way to the shop-foundations, of which Z denotes the ground, z the ground-line, and Z' a trench or other suitable conduit, wherein the tilting device C is conveniently situated, said device consisting in Figs. 1 and 2 of a hydraulic pulling-jack, C', acting as an adjustable anchor for a cable, c , adapted to be led and guided over one or other of a series of snatch-blocks, c' , &c., which, like said jack, are bolted or otherwise fixed to the ground. From them cable c , being passed upward, bridles the porter-bar D, preferably by a tackle or loose ring, c^2 , so that said porter-bar may be both swiveled and slid freely endwise through this bridle-ring, which, to facilitate such movement, is further preferably provided with transverse handles $c^3 c^3$, the porter-bar D being, in this case, that illustrated in Figs. 1 and 2, (as well as in those Figs. 3 and 4 and 3^a and 4^a, represented as of the separate sort,) and attached to the use of a forging, E, by what is technically called a "tong-hold," to wit: the crotch $d d$ and the tongue e , whereas, in the case of Figs. 5, 6, and 7, it is represented as of the integral sort, and consists of the free, and, generally speaking, unheated end of the continuous ingot or forging D', whereof E' is the heated portion corresponding to the use E about to be hammered. Now, this mass, with the heated end preponderating and seated on the anvil, is shown in Figs. 1 and 2 suspended upon a sling, F, hanging from the fall F' of a traveling trolley-crane, F², of which $f f$ are the rails and $f' f'$ the stringers of the overhead track, its winding mechanism being indicated by the drums F³ F³, while the rest of said crane's mechanism, being well understood, is here left without further detail. Save when such crane is employed as the suspending device it is best adapted to carry out my invention when its tracks are spread and spanned, as in Figs. 2^a and 3^a, by a traveling bridge, F⁴, whereon the trolley F² is adapted to traverse substantially as there indicated by the bridge-girders $f^2 f^2$ and wheels $f^3 f^3$. However, said sling F may, as shown in Fig. 5, be adapted to merely raise or lower, as by attaching it to a purchase or tackle-fall, F', secured to some convenient point above, or else when the capacity of the tilting device for movements and adjustments is further developed and rendered substantially that of an inverted counterpart of the above-mentioned and well-

understood traverse trolley-crane. It is in many cases possible to float and mechanically manipulate the porter use or forging by hanging it with the aforesaid preponderance on a mere support. Such modification is illustrated in Fig. 3, where the sling F is the bight of a chain simply hanging from above.

But deferring further detail of the parts and passing to the operations of the illustrated devices and modifications, I commence here with Fig. 1^a, in which N, O, P, and Q indicate, by their outlines in plan, an ordinary gang of forge-furnaces, in one or other of which—say N—the work or porter provided use (see E D, Fig. 2) has been brought to a proper heat. Then the bridge-traversing trolley of the overhead traveling crane F², Fig. 2^a, being brought to a proper position on its pier-supported tracks H, its fall F' is attached to the work by the sling F at such a point that the preponderance required to effect proper seating on the anvil in the subsequent hammering is at once, and without further shifting, assured, and the shackle c² of the tilting cable c being slipped loosely over the tail of the porter-bar D the overhead crane is then operative, not only to lift the use from its bed in the fire by taking a hoist with its fall, but it can also, by traversing or traveling, withdraw the use from the furnace, for in such lifting the under faces of the top flange of the I-shaped conduit-rail K, Fig. 3, afford an anchorage against an upward movement in the wheels j j of the trolley-yoke J, to which the lower end of the cable c is linked; and in such withdrawal these wheels, rotating about their axles i i, travel along said rail as a guide and steer the porter-bar to which the cable c connects them until they have passed down the siding n and come to the switch n', which, pivoting in the axis of the main line L, is then manipulated after the manner of an ordinary railway-switch to shunt the trolley-yoke J to said main line, down which line the movement of the overhead crane, being suitably changed, the traveler J is next towed and finds its way to the hammer. However, instead of a single track in such railway-systems, multiple tracks may be employed, as shown in Figs. 4 and 5, wherein a four-wheel trolley-truck, J', constitutes the anchorage, and by its greater breadth and location within the four rails j' j' j' j' affords not only a better guiding capacity than a single-track trolley, J, but also, as indicated in dotted lines in Fig. 4^a, affords a chance to increase and spread the anchorage-connections, and thereby to steady and free the floating mass from vibration and jolting. A still further increase in anchorage range is shown in Figs. 3 and 4, where anchorage-rails j² j² j² j², still more distant and spanned by a bridge carrying a traversing-trolley, J², as above alluded to, are employed; but in some cases, where the furnace and hammer are more closely associated, I find that the radius that the combined length of the porter-bar and use afford is frequently sufficient to dis-

pense with any railway system. For example, if in Fig. 1 the door of the furnace be substantially the point of view, and its distance substantially the same as that of the hammer A from the pulling-jack C, a simple lift and traverse of the crane F' will carry the use or heated end from one point to the other, the slinging being here, as in all the other cases, such as to produce a proper preponderating tendency of the heated end, and the porter being bridled from involuntary tilting, as by the pulling-jack C through the shackle c² and cable c. During "traverses" it is generally preferable to maintain work DE substantially level, as shown in Fig. 2, and for this the purchase F' for the most part amply suffices; but should it be desired to raise or lower the work while in this level floating state the underground trolley may be elaborated into such a structure as is illustrated in Fig. 4; and, further, by the combination and the traveling, traversing, and hoisting and paying-out capacities of cranes as tilting and suspending devices the compass direction as well as the altitude of the floating mass may be determined at will and without change from a level state, either in transit or at the hammer.

Arrived at the hammer, the operations, &c., are, briefly, as follows:

First. The devices shown in Figs. 1 and 2 will not only effect a proper level, but they will also serve to vibrate the floating mass in any desired vertical divergence by either lifting with the fall F' and pivoting about the shackle c², or else by pulling with the jack C' and pivoting about the sling F, or even and more quickly by pulling on F' and c concurrently, longitudinal feeding of the use E through the hammer and anvil a and a' being permitted by the freedom of the shackle c² endwise of the porter-bar D, horizontal changes of location being effected by suitable traverses of the trolley F².

Second. In the device illustrated in Figs. 3 and 4 the capacity for horizontal vibrations is still further increased by the traversing and traveling of the inverted crane, and the spring S, inserted between the links of the cable C, affords a means of absorbing vibration and increasing the life of the attached devices, which is of a great advantage.

Third. In Figs. 5 to 7 depressions of the porter-bar are effected by altitudinal adjustments of the jibs T T of the downwardly-acting inverted derrick V, in which the dotted cylinder C², Fig. 5, indicates said jib's actuating mechanism, V V' its wheeled stay-carriage, and the post v' its guide part and fixed frame. However, said jibs being at a suitable height, as shown in Fig. 5, and there held rigidly, as by fixing the ram immovably, said device also illustrates that modification in which a stationary bridle engages the porter-bar, while motion is developed solely by softening and lengthening or traversing with the suspending-crane, &c., as must now be fully understood.

Fourth. By combining the overhead crane of Figs. 1 and 2 with the sling F and attaching an inverted underneath crane, as shown in Figs. 3 and 4, both plane and conic figures
 5 can be generated in the floating mass as the incident of such crane's manifest manipulating capacities, for, as in case 1 above, either may be called on to effect movements in the floating mass about the other's meanpoint of
 10 attachment or by simultaneous action about many other centers.

Finally, in the operation of all these devices I prefer that during the actual action of the hammer the anchorage-cable c, or its
 15 equivalent, should be slacked off from or released from actual contact with the porter-bar D; but as this may sometimes be neglected or not be convenient I generally prefer to contrive and provide the anchorage-
 20 connection, as shown in Figs. 3 and 4, with an intermediate spring-recoil check.

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

25 1. As a forging mechanism, a steam-hammer, in combination with a suspending device, whereby the forging is sustained, a tilting device, whereby the floating of the forging is effected, and mechanism for altering
 30 the length of one or both of said devices, so as to enable the forging to be manipulated under the hammer, substantially as and for the purpose specified.

35 2. In a forging mechanism, a steam-hammer and a furnace, in combination with a traveling suspending device, whereby the forging is sustained and transferred from said furnace to said hammer, a tilting device, whereby the floating of the forging is effected,
 40 and mechanism for altering the length of one or both of said devices, so as to enable the forgersmen not only to transfer a forging from

furnace to hammer, but also to manipulate it under said hammer, substantially as and for the purposes hereinbefore described. 45

3. In a forging mechanism, a steam-hammer and a furnace, in combination with an overhead traveling and traversing trolley-crane, whereby the forging is sustained, a
 50 traveling tilting device, whereby the level of said forging is regulated when suspended, a rail system, whereby said tilting device is anchored and guided, the whole co-operating to enable the forgersmen not only to transfer a
 55 forging from furnace to hammer, but also to manipulate it mechanically under said hammer, substantially as and for the purposes hereinbefore described.

4. In a forging mechanism, a steam-hammer, in combination with one or more fur- 60
 naces, a fulcrum, and an underneath inverted downwardly-acting traveling trolley-crane, the length of whose tackle, being alterable at will, enables the forgersmen to suspend the forging
 65 upon said fulcrum in a floating and preponderating condition, so as to traverse it to, manipulate it beneath, and rest it upon the anvil of said steam-hammer, substantially as and for the purposes hereinbefore described.

5. In a forging mechanism, the combina- 70
 tion of a steam-hammer, a crane, one or more furnaces, an underneath switch, provided anchorage-railway leading from said hammer to said furnace or furnaces, a truck adapted to
 75 run along and be guided by said rail system, and an anchor-bridle attached to said truck and adapted to steer and maintain forgings when suspended on said crane in a floating posture, substantially as and for the purposes hereinbefore described.

FREDERICK W. TAYLOR.

Witnesses:

GEORGE HOUSE,
 JOSHUA MATLACK, Jr.