No. 641,991.

Patented Jan. 23, 1900.

F. C. NORRIS.

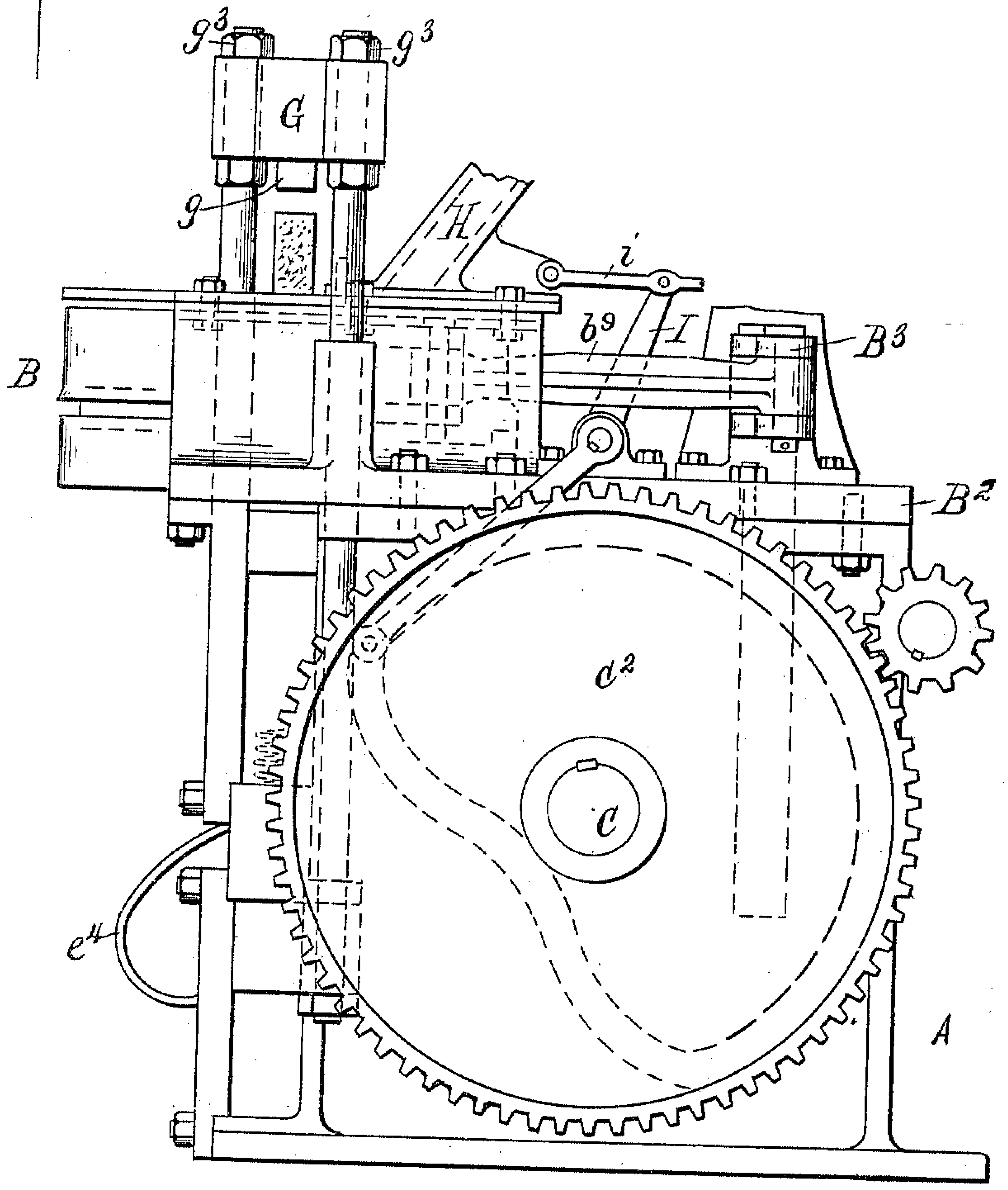
BRICK MAKING MACHINE.

(Application filed Apr. 12, 1898.)

(No Model.)

5 Sheets—Sheet 1

FIG. 1.



Witnesses:
W. E. Allen.
Rollo Elliott.

Inventor:
Frederick C. Norris,
by R. G. Dyrenforth,
his attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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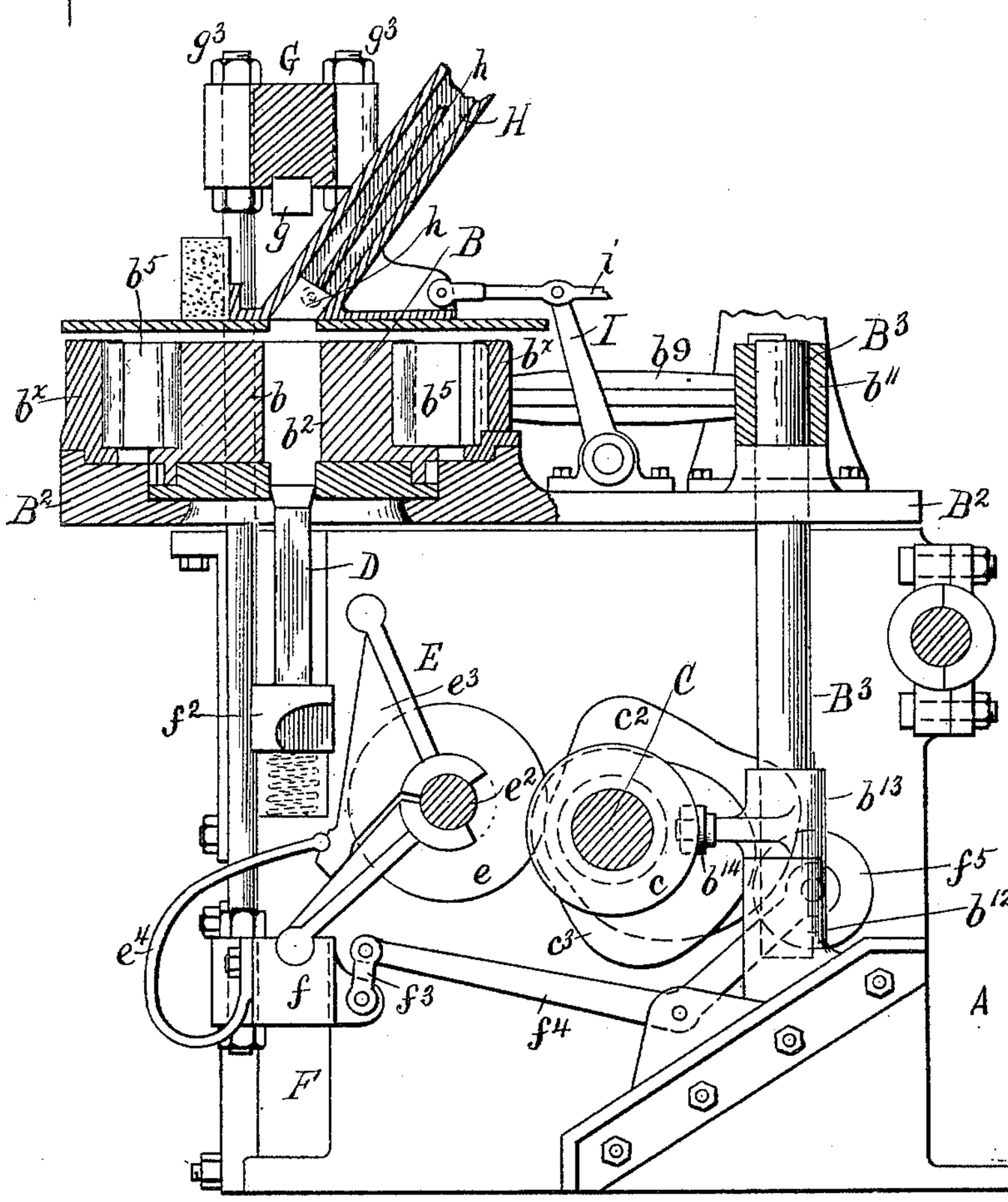
(No Model.) 5 Sheets—Sheet 2.

FIG. 2.



Witnesses:
W. E. Allen.
Robert Ewin H.

Inventor:
Frederick C. Norris,
By R. S. Dyer Firth,
his attorney.

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F. C. NORRIS.

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(No Model.) 5 Sheets—Sheet 3.

FIG. 4.

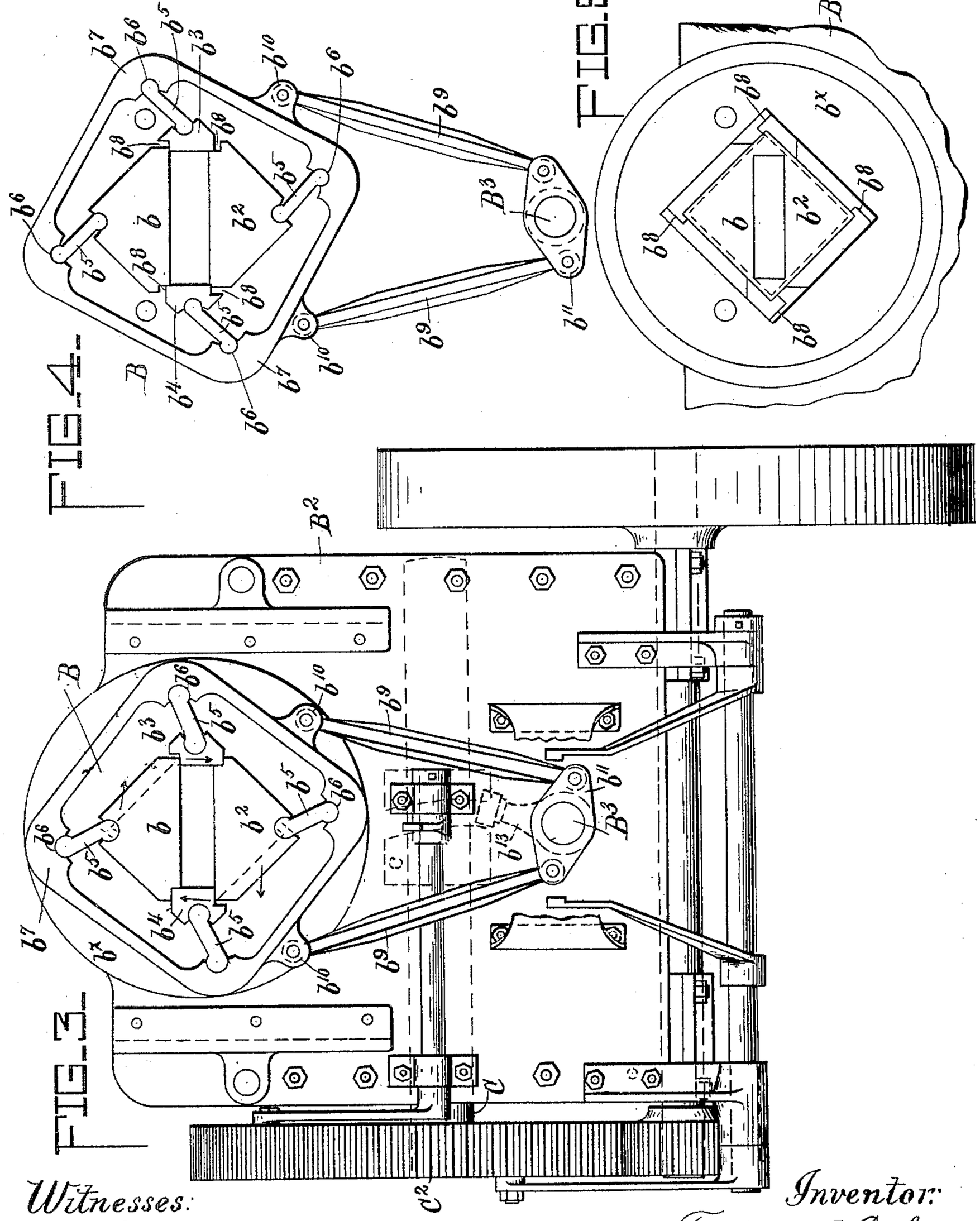

FIG. 5.

FIG. 3.

Witnesses:
W. E. Allen.
Belle, Eccioth.

Inventor:
Frederick C. Norris,
by R. S. Dyrenforth,
his attorn.

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F. C. NORRIS.

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(No Model.) 5 Sheets—Sheet 4.

FIG. 6.

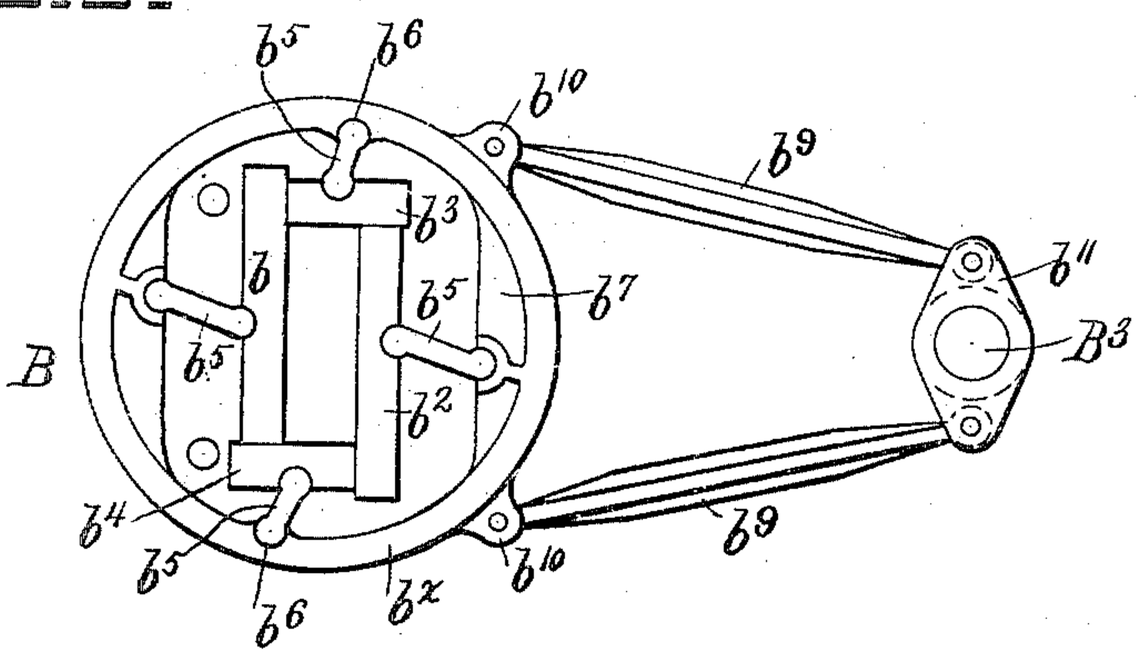
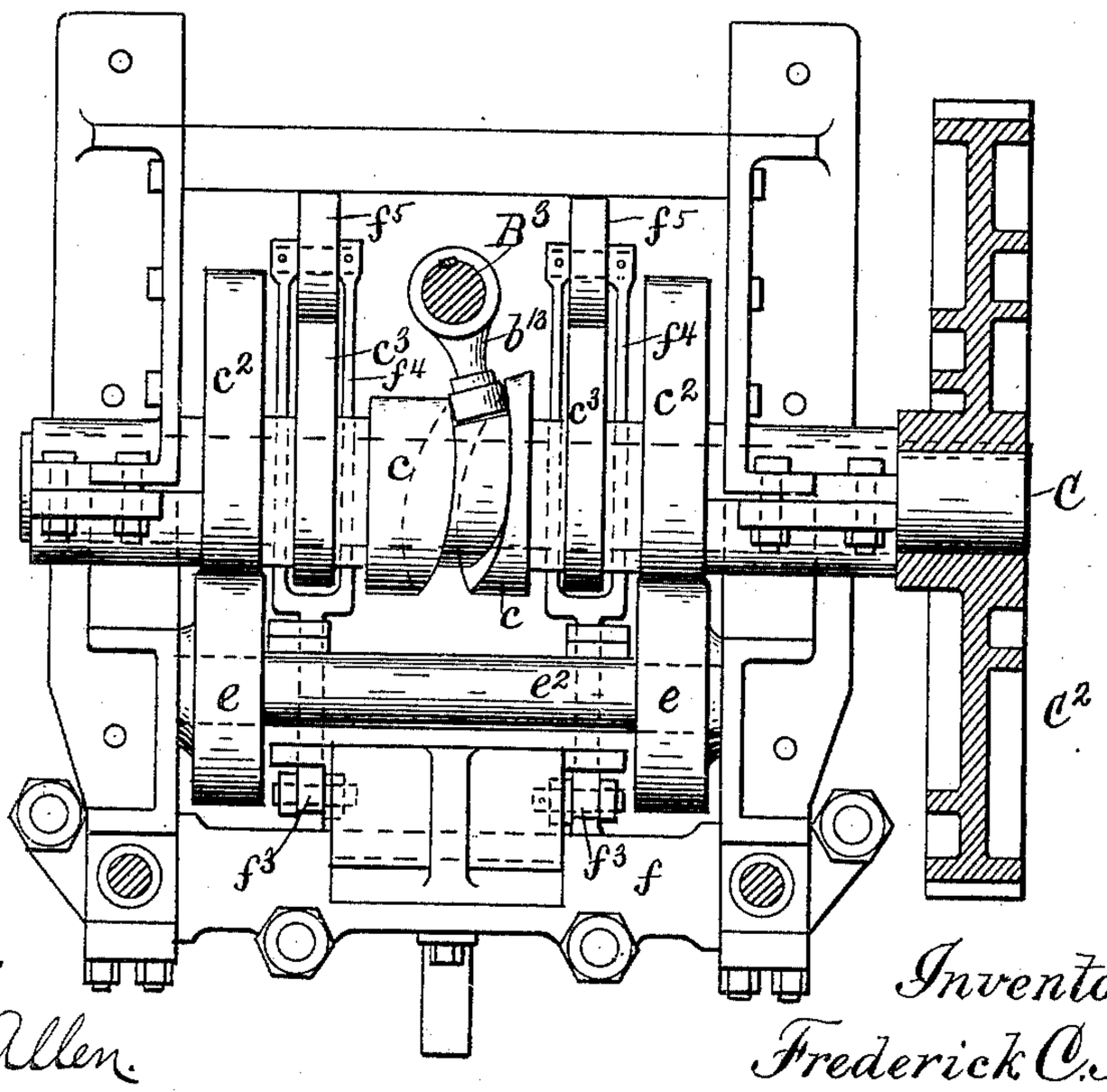


FIG. 7.



Witnesses:
W. E. Allen.
Pelle Cecil H.

Inventor:
Frederick C. Norris,
by R. F. Dyer & Co.,
his attorney.

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F. C. NORRIS.

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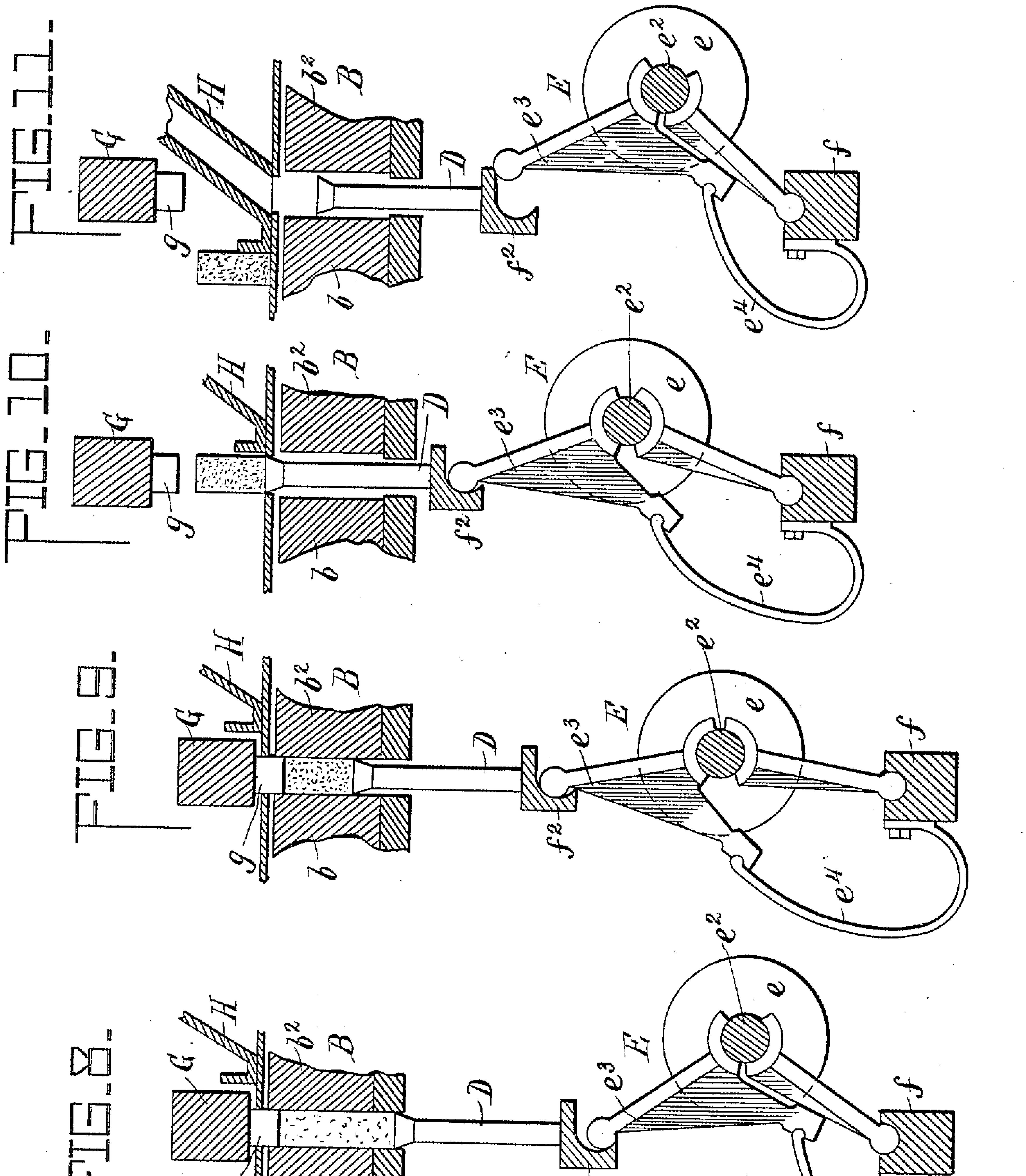
(No Model.)

5 Sheets—Sheet 5.



Witnesses:
W. E. Allen.
Robt. Everett.

Inventor:
Frederick C. Norris,
by R. G. Dyrenforth,
his attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FREDERICK C. NORRIS, OF DETROIT, MICHIGAN.

BRICK-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 641,991, dated January 23, 1900.

Application filed April 12, 1898. Serial No. 677,383. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK C. NORRIS, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Brick-Making Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to brick-making machines.

In the manufacture of sand brick—that is to say, brick made from a plastic mass composed of sand and a suitable binding agent, which causes the sand to become solid when set and capable of withstanding greater crushing strain than ordinary bricks that are burned—it is essential to the production of a brick true in contour that provision should be made for releasing the mass after subjection to requisite pressure to form the brick and before the finished brick is discharged from the machine, thereby obviating presentation of bricks with broken corners and rough sides, which would inevitably appear if the bricks, while still under lateral pressure in the mold, were forced from the mold upon the discharge-table, this for the reason that as the brick passes from the mold it expands, and thereby tends not only to destroy the corners and sides of the brick, but also to cause the brick to bulge, warp, and set unevenly.

It is the object of this invention to provide a machine in which the brick after it has been subjected to the requisite pressure in the mold will be relieved of such pressure at the proper instant, permitting the brick to expand to its full extent within the mold, so that when forced from the mold it will be perfect in shape, with the corners and sides true and smooth. Furthermore, to provide a mold in which the sides and ends will be adapted for lateral yield, but in which the corners will always remain tightly closed to preclude entrance of sand or other matter between the corners of the mold, which would prevent these from closing together in the subsequent operation of forming bricks and would render necessary frequent cleaning of the mold at these points.

With these objects in view the invention consists in the novel construction and combination of parts of a brick-making machine, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification and in which like letters of reference indicate corresponding parts, I have illustrated a form of embodiment of my invention, it being understood that other forms of embodiment thereof may be employed without departing from the spirit of the same.

In the drawings, Figure 1 is a view in side elevation displaying so much of a brick-making machine as relates to my invention. Fig. 2 is a view in side elevation, partly in section, showing certain parts of the mold-operating mechanism hidden from view in Fig. 1. Fig. 3 is a view in plan, partly in section, displaying the mechanism for opening and closing the mold-sections, the walls of the mold in this figure being closed. Fig. 4 is a detail view in plan, partly in section, displaying the mold with the walls thereof open. Fig. 5 is a view in plan, displaying the upper faces of the mold and also the table over which the finished brick is moved when discharged from the mold. Fig. 6 is a view similar to Fig. 4, showing a slightly-modified form of mold-wall. Fig. 7 is a detail view in plan, partly in section, showing more particularly the mechanism for opening and closing the walls of the mold; and Figs. 8, 9, 10, and 11 are detached detail views in elevation, partly in section, displaying the different positions assumed by the toggle in operating the plunger when compressing a brick and forcing the same from the mold.

Referring to the drawings, A designates the framework, suitably constructed to support the operative parts of the device.

As the mold and mechanism for operating the same constitute the gist of the present invention, this part of the apparatus will be first described.

The mold B comprises two side walls b b^2 and two end walls b^3 b^4, the walls being removable for purpose of repairs or of replacement, when necessary. These walls rest upon the upper face of a plate B^2, constituting the top of the apparatus, as clearly shown in

Figs. 1, 2, and 3, and are in this instance approximately triangular, although they may be of any preferred shape, and each is provided at its apex with a socket, in which works one end of a fulcrum b^5, the opposite end of which engages a socket b^6, formed in the walls of a movable boxing or frame b^7, inclosing the mold, the boxing being secured in this instance to a circular plate $b^\times$, working in a recess formed in the upper face of the table or plate B^2. One end of each wall is incut, as shown at b^8, and overlaps the edge of the adjacent wall, by which arrangement, when the walls are moved laterally by mechanism hereinafter to be described, as indicated by the arrows in Fig. 3, the corners of the mold will be kept perfectly sealed, thus to preclude entrance of the plastic mass between the walls of the mold, which would not only prevent proper operation of the mold, but would result in the output of a brick having rough sides and uneven corners. It will be obvious, however, that, if preferred, the four walls of the mold where they contact with each other may be perfectly straight—that is to say, the incut portion may be omitted, as shown in Fig. 6.

The mechanism for imparting lateral motion simultaneously to each of the walls, whereby space is left between the walls and the brick, thereby permitting expansion of the brick when pressure is removed, comprises two rods b^9, each of which is secured at one end to one of a pair of bosses b^{10}, projecting from the boxing b^7, and at its other end to a plate b^{11}, keyed or otherwise secured to a shaft B^3, having its lower end stepped in a boxing b^{12}, suitably supported in the frame. The lower portion of this shaft B^3 has rigidly secured to it an arm b^{13}, (clearly shown in Figs. 2, 3, and 7,) the free end of which carries a roller b^{14}, working in a grooved cam c, mounted on a cross-shaft C, suitably supported on the frame of the apparatus, this shaft constituting the main drive-shaft for operating the other parts of the apparatus, as will appear farther on. The movements of this cam are so timed that while the brick is being subjected to pressure the walls of the mold remain closed; but the instant the plunger has reached its highest point and starts to recede the cam-groove shifts the arm b^{13} and through the medium of the rods b^9 turns the boxing b^7, which latter, through the agency of the fulcrums b^5, shifts each of the walls of the mold laterally the requisite distance, the difference between the closed and open positions of the wall being exhibited, respectively, in Figs. 3 and 4.

The plunger D, by which the plastic mass is compressed in the mold, is forced upward by a toggle-joint E, one member of which is permanently in engagement with a sliding collar f on a standard F and the other in alternate engagement and disengagement with a similar collar f^2 on the plunger. The mechanism for operating the members of the toggle-joint comprises a cam c^2, mounted on the shaft C, the perimeter of this cam being in engagement with a roller or disk e, carried by the fulcrum e^2 of the toggle-joint, the upper members of the joint being provided in this instance with an extension e^3, adapted to bear upon the lower member, and thus limit the inward movement of the two parts, a spring e^4, having one end securely bolted to the collar f and the other end in engagement with the extension e^3, serving to keep the two members closed when requisite. The collar f is operated through the medium of a link f^3, a bell-crank lever f^4, and a cam c^3 on the shaft C, the perimeter of the latter cam being in engagement with a roller or disk f^5 on the free end of the bell-crank lever f^4, the said lever being supported at its bend upon a suitable standard secured to the frame.

The mechanism for closing the mouth of the mold comprises a cross-head G, carrying an ordinary die g, adapted to fit accurately within the mold-opening, so that when pressure is applied to the material within the mold there can be no escape at this point. The cross-head is secured to two rods g^3, the lower ends of which are secured to the collar f. The die is made removable from the cross-head to permit of replacement of a new die should one break or become worn out.

The coaction between the walls of the mold, the plunger, and the die is as follows: The material (which in this instance is sand wetted with any substance which will render it hard upon exposure) is fed down a chute H from a suitable source (not shown) and is preferably forced to position by a plunger h, operated by any suitable mechanism, and passes to the mold. At the beginning of the operation the parts are in the position shown in Fig. 2, in which the finished brick is shown as moved to one side by a plate on the chute, thus bringing the chute in proper position to permit the deposit of a fresh charge. At this point it may be stated that in each operation of the machine the upper member of the toggle-joint is released from engagement with the socket in the collar f^2 and occupies the position shown in Fig. 2. The machine being in motion the cam c^3, through the medium of the bell-crank lever f^4 and link f^3, will move the collar f down. As this motion takes place the chute is moved to one side by mechanism hereinafter to be described, and the die is forced down into the mold, as shown in Fig. 8. By this time the collar f^2 will have moved a sufficient distance downward to allow the free end of the upper member of the toggle-joint to engage with the socket in the collar f^2, and the surface of the cam now presented to the disk f^5 is such as to hold the collar f^2 stationary. At this moment the surface of the cam c begins to exert pressure against the disk e, operating to force the toggle-joint to one side and spread the same, and thus force the plunger D upward and compress the material within the die. At the instant the plun-

ger has reached the limit of its upward stroke and begins to recede the grooved cam shifts the arm b^{13} and through the medium of the rods b^9 partially rotates the boxing or frame b, and thus forces the walls of the mold free from the brick. The cam c holds the toggle-joint at the point last described, and the cam c^3 now comes into play and forces the plunger up to the position shown in Fig. 11, with its upper surface flush with the top of the table, at the same time raising the die at a rate of speed proportional to that of the movement of the plunger, so that there will be no interference between these two parts. By the time the plunger has reached the position shown in Fig. 10 the chute is moved forward, and its outer face forces the brick to one side and again brings the chute in position to feed a fresh charge of material to the mold. As soon as the plunger has reached the position shown in Fig. 10 and the brick has been removed, as shown in Fig. 11, that portion of the perimeter of the cam c is brought opposite the roller e to permit the toggle-joint to recede laterally to the position shown in Fig. 2 and out of engagement with the socket in the collar, whereupon the plunger by gravity will drop back to its normal position and the operation of the machine will be repeated.

The mechanism for operating the chute to cause it to remove a brick when compressed and at the predetermined moment to cause the chute to come over the mold comprises a rock-lever I, connected, through the medium of a link i, with the chute H, the free end of the lever I being provided with a roller which engages a cam-groove formed in one side of a gear-wheel C^2 on the shaft C, this gear-wheel constituting the main drive-wheel. The cam-groove is so disposed with relation to the surface of the other cams that the chute will only operate at the predetermined moment of time.

It will be seen from the foregoing description that while the plunger is ascending the walls of the mold are kept closed and that just at the instant when the upward pressure of the plunger ceases to be applied these walls open a sufficient distance to allow the brick to expand to its limit, so that in the subsequent removal of the brick there will be no contact between the four sides of the mold and the brick, and the release of the sides of the mold from the brick and the time at which it occurs are such that there will be no danger of the mold taking away, as a result of adhesion, any part of the brick, as the opening of the walls is not suddenly outward on all four sides, but is in the nature of a sliding movement, so that contact between the walls of the mold and the brick is somewhat gradual, though, in effect, very rapid.

Bricks made by machines constructed in accordance with this invention are of uniform size, leave the machine in perfect condition without having rough sides or broken edges, and will when in condition for use be perfect in shape.

I am aware that it is not broadly new to employ molds having movable sides and ends, as this is clearly shown and described in the British Patent No. 1,130 of 1886, wherein the following language occurs: "In order to retain the sand uniformly on the faced sides of the brick, I pass the brick to be pressed into an expanding mold, which is not closed until the brick has been placed in position ready for pressing, the mold being also opened or expanded before the pressed brick is forced out. For this purpose the sides of the mold are advanced and drawn back at the proper times by means of eccentrics or cams, these being actuated by some moving part of the machine. It will be evident that an expanding mold as above described can be used in the pressing of other than sand-faced brick." But it will be seen that this is for a purpose entirely different from that devised by myself, inasmuch as the sides and ends of the mold are in the said patent simply brought together for the purpose of sanding the surface of the brick and are opened when the brick is inserted, whereas in the case of my invention the walls are closed when the material is fed to the mold. Moreover, the device of this patent would not be operative for making a sand brick, inasmuch as by drawing back the sides and ends of the mold an opening is left at the corners, where the plastic mass would lodge and gum, and would thus defeat the very object of my construction, wherein I have a lateral slide of the walls one upon the other, but never an opening at the corners.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

In a brick-making machine, the combination with a die and plunger, of a mold having movable sides, a frame or boxing inclosing the walls of the mold, fulcrums interposed between the walls and the inner sides of the boxing, rods connecting at one end with the boxing, a shaft carrying a plate to which the other ends of the rods are secured, and a cam adapted, at predetermined times, to rotate the shaft and, through the medium of the rods, to turn the boxing, thereby to open and close the members of the mold, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK C. NORRIS.

Witnesses:
R. G. DYRENFORTH,
R. M. ELLIOTT.