E. E. BROSIUS.

CLAY GUN OPERATING MECHANISM.

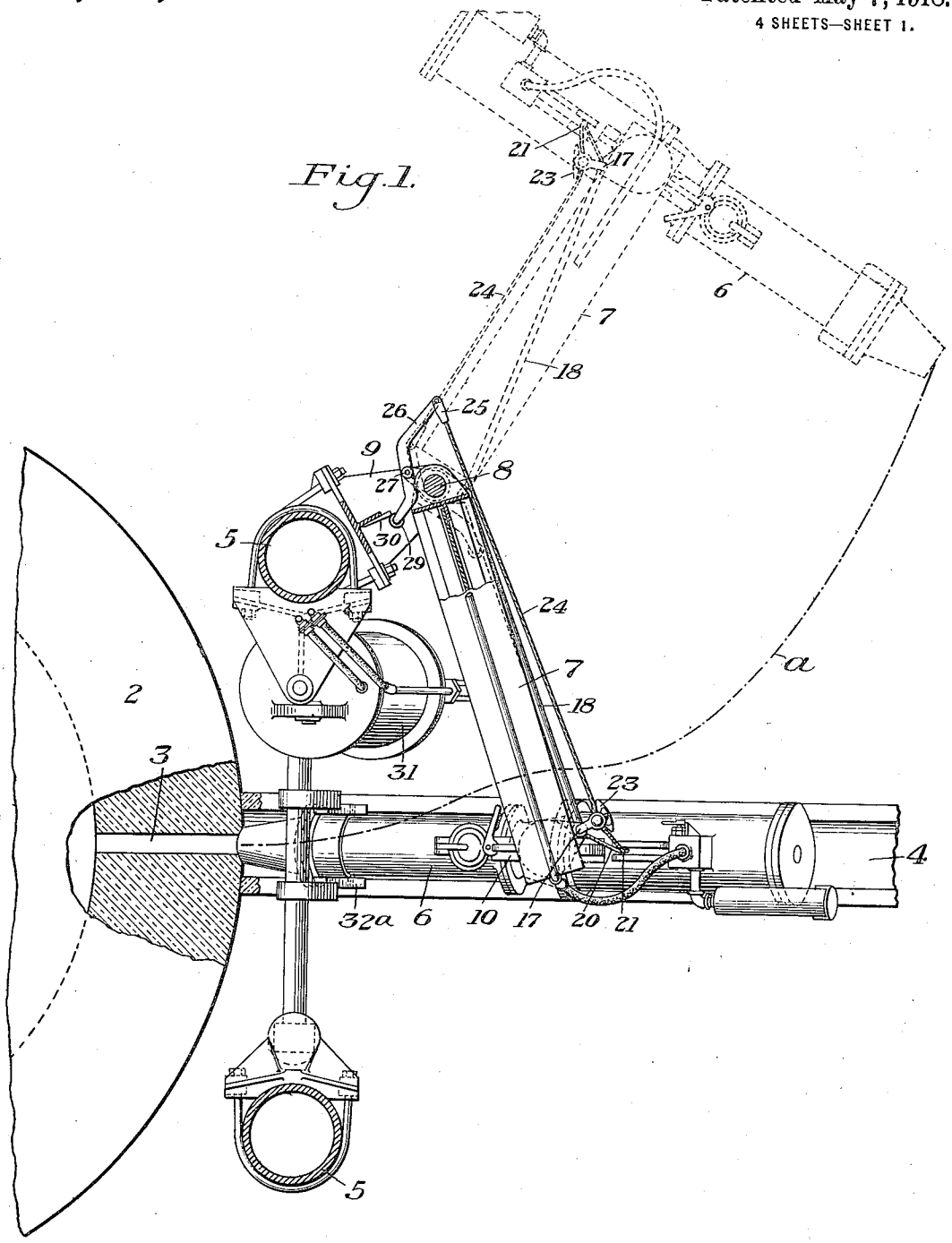
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1,265,602.

Patented May 7, 1918.

4 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

Jesse B. Heller

R. A. Baldwin

INVENTOR

E. E. Brosius

by Baldwin, Byron & Parmele

Attys.

E. E. BROSIUS.

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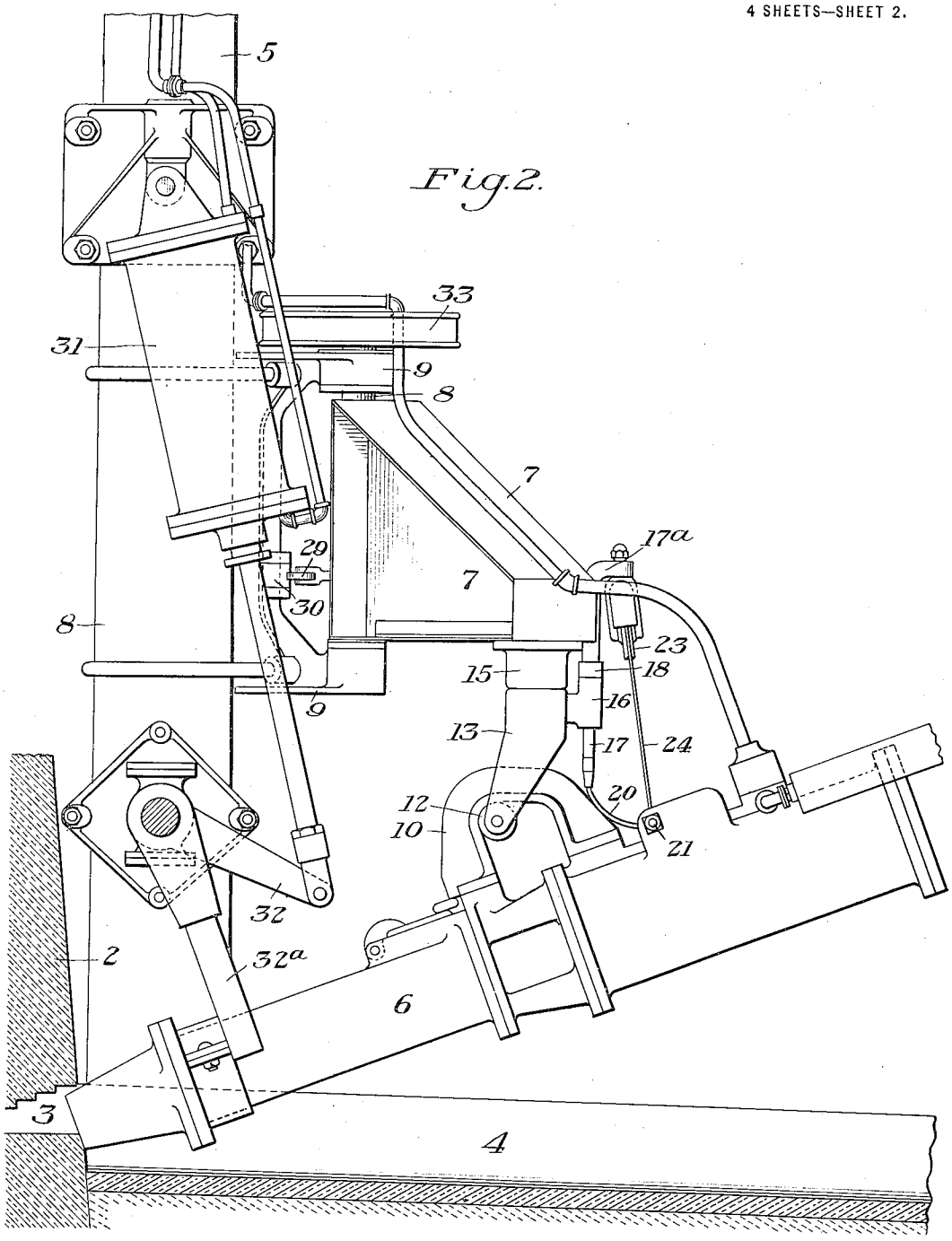
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4 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

Jesse B. Keller

W. V. Balderson

INVENTOR

E. E. Brosius

by Baker, Rowe & Parmele

Attys

E. E. BROSIUS.

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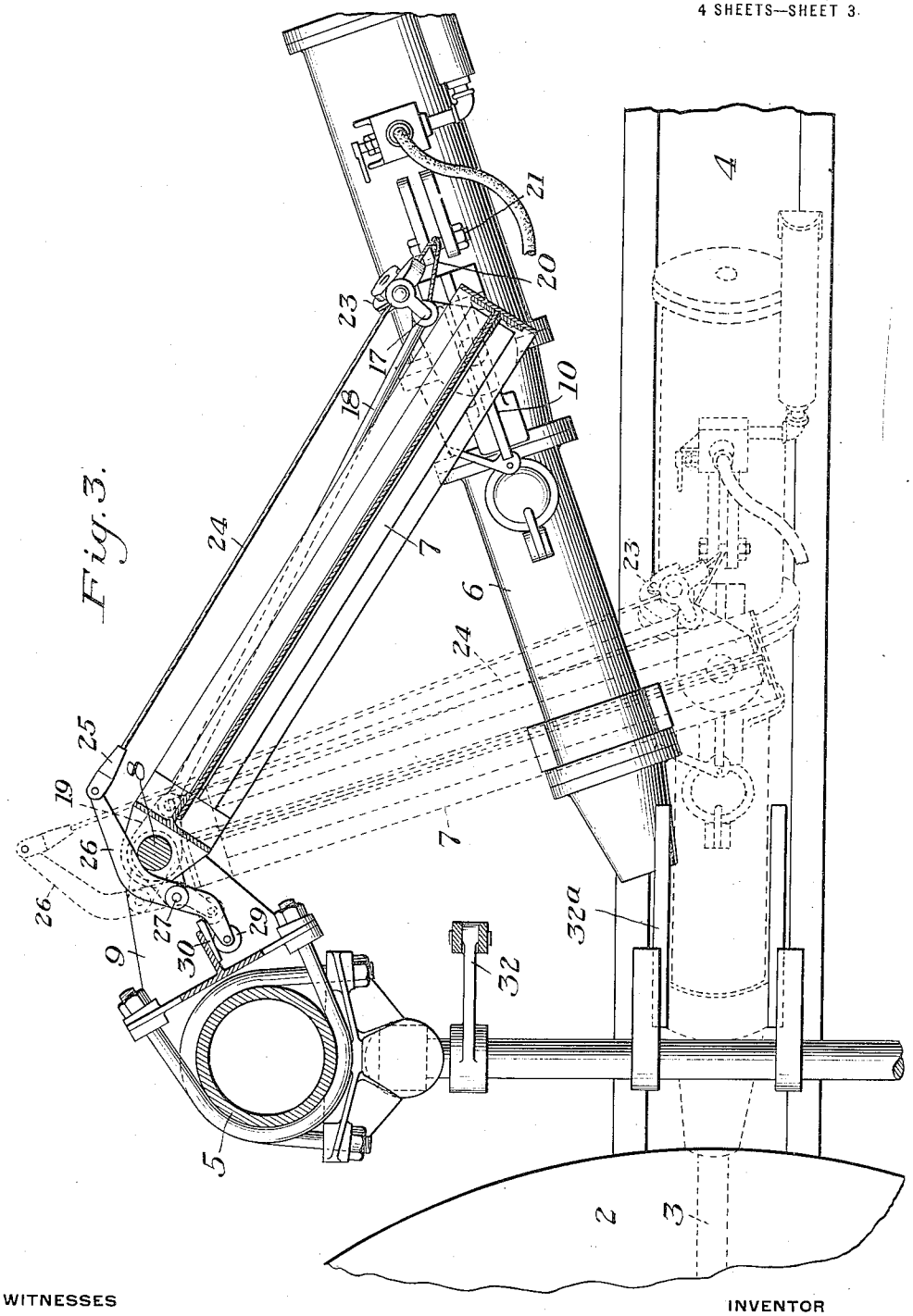
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4 SHEETS—SHEET 3.

Fig. 3.



WITNESSES

Jesse B. Heller

R. A. Baldeson

INVENTOR

E. E. Brosius

by Bakewell, Byrnes & Parmele

Attys.

E. E. BROSIUS.

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4 SHEETS—SHEET 4.

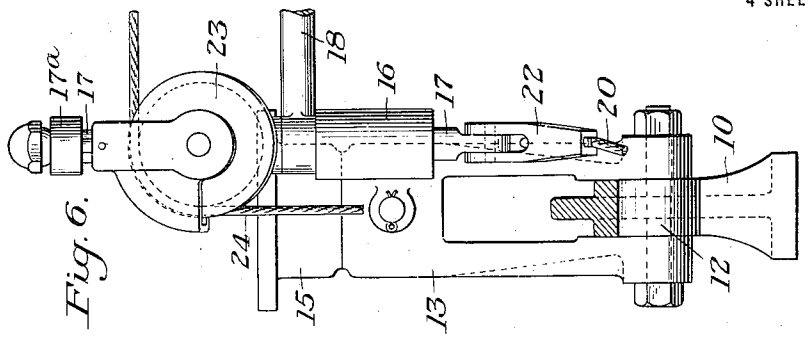


Fig. 6.

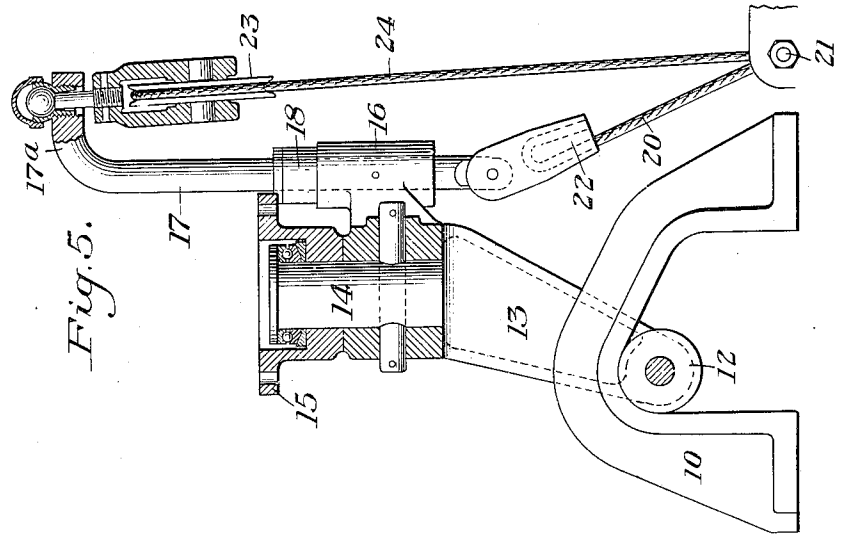


Fig. 5.

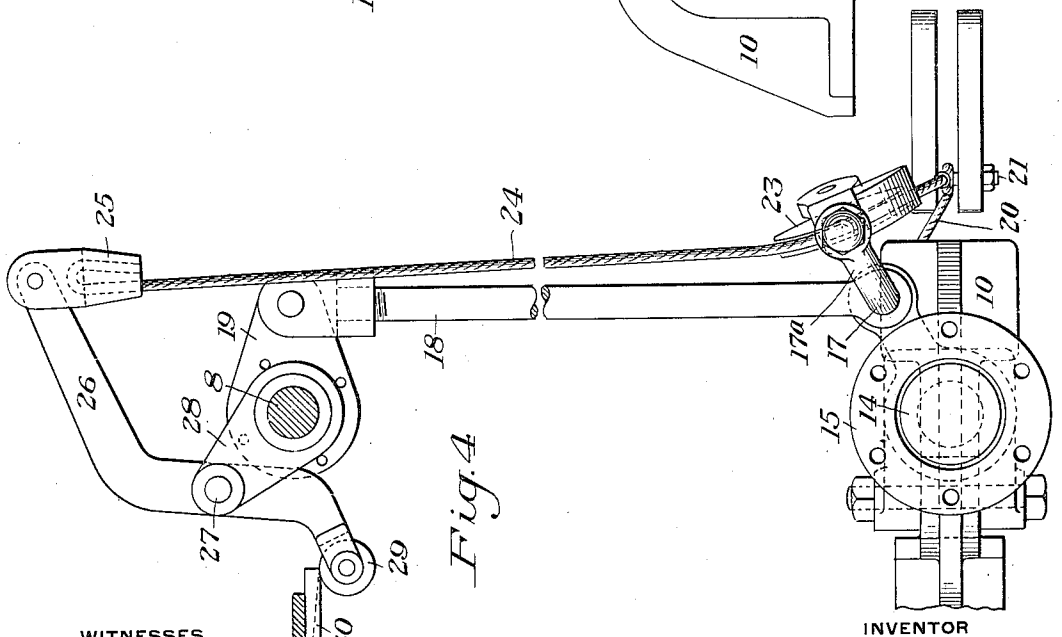


Fig. 4

WITNESSES

Jesse B. Keller

N. H. Balderson

INVENTOR

E. E. Brosius

by Baldwin, Egan & Fawcett

Attys.

UNITED STATES PATENT OFFICE.

EDGAR E. BROSIUS, OF PITTSBURGH, PENNSYLVANIA.

CLAY-GUN-OPERATING MECHANISM.

1,265,602. Specification of Letters Patent. Patented May 7, 1918.

Application filed January 28, 1918. Serial No. 214,070.

To all whom it may concern:

Be it known that I, EDGAR E. BROSIUS, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Clay-Gun-Operating Mechanism, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional plan view of apparatus embodying my invention, certain of the parts being shown in one position in dotted lines and in another position in full lines;

Fig. 2 is a sectional elevation of the same;

Fig. 3 is a sectional plan view showing the parts in another position; and

Figs. 4, 5 and 6 are detail views of certain of the parts hereinafter more fully described.

My invention relates to devices used in plugging the tapping holes of blast furnaces at the completion of furnace casting operations, and more particularly to the operating mechanisms of clay guns used for that purpose.

The present invention is an improvement upon the clay gun-operating mechanism described and claimed in the patent of H. A. Berg, No. 1,121,224 of December 15, 1914.

One object of the present invention is to provide means of novel character for moving the gun into and out of its operating positions. It frequently happens that the mantel-supporting columns, the twyers or other adjuncts of the blast furnace structure are so located and arranged that it is not practicable to support the gun in the manner described in the said Berg patent, because certain of the parts prevent or interfere with the swinging movement of the gun therein shown and described. Furthermore, the columns are not usually located to permit the gun to be mounted thereon and swing properly. My present invention is designed to overcome this difficulty and to provide means of simple and effective character for modifying the swinging movement of the gun to meet conditions of this character.

A further object of my invention is to provide means of novel and effective character for automatically tilting the gun to depress its nozzle into clay-discharging position.

Referring to the accompanying drawings, in which I have shown a preferred embodiment of my invention and which will now be described, the numeral 2 designates a portion of a blast furnace structure having the usual iron tapping hole 3 and the skimmer trough or runner 4, in which the molten metal is conducted from the tapping hole.

The numeral 5 designates the usual mantel-supporting columns, and 6 is the clay gun, which may be of any usual or well known character, the particular construction of the gun itself forming no part of my present invention.

The gun is suspended from a swinging boom 7, which, in accordance with my invention, instead of being mounted to swing directly about the axis of one of the columns 5, as a center, is fixed to a vertical shaft 8, which is rotatably supported in a bracket 9, fixed to one of said columns. The gun is provided with a trolley rail 10, which may be similar to that described in the said patent and which is engaged by an anti-friction roller 12, carried by a bracket 13, which is rotatably swiveled to the end of the boom 7, in the manner best shown in Figs. 2 and 5. For this purpose, the bracket 13 is provided with a headed swivel pin 14, having a suitable bearing in a bearing plate 15, which is secured to the under side of the end portion of the boom. The bracket 13 has a laterally projecting sleeve arm 16, which is secured to a vertical rod 17. 18 is a link which is pivotally connected at one end to a fixed member 19, secured to the bracket 9, and which at its other end engages the rod 17 in the manner best shown in Figs. 4 and 5. It will be noted that the point at which the end of the link is connected to the bracket 19 is at a short distance to one side of the center of the boom shaft 8. It will therefore be apparent that as the gun is swung from its inoperative position, shown in dotted lines in Fig. 1 to the operative position shown in full lines in said figure, the said link will act upon the gun through the described connections to change its angular relation to the boom. This change is such that the nose of the gun instead of swinging on the arc of a circle whose center is the center of the shaft 8, will be an irregular curve, such as that indicated by the dotted line *a* in Fig. 1. It will be seen that the nature of this curve

is such that the gun as it swings into operative position, will come lengthwise over the skimmer trough or runner 4, and will then move inwardly toward the tapping hole in a nearly straight line.

After the gun has come to position lengthwise over the skimmer trough, it is necessary to depress its nozzle into clay-discharging position, for the reasons described in the said Berg patent. The gun is normally held in substantially horizontal position by the flexible member 20, which is attached at one end to the gun, as indicated at the point 21, and at its other end is shown as connected to a clevis 22, (see Figs. 5 and 6) which is pivoted to the lower end of the rod 17. The upper end portion of the rod 17 is bent horizontally outwardly, as indicated at 17ª, and has swiveled thereto a depending sheave or pulley 23. 24 is a flexible member which is also shown as being connected to the gun at the point 21, and thence passes upwardly and over the sheave 23, its opposite end being connected to a clevis 25, pivoted to the longer arm of a bent lever 26, as best shown in Figs. 1, 3 and 4. The lever 26 is fulcrumed at 27 to an arm 28, which is fixedly secured to the boom shaft 8, to rotate therewith. The shorter arm of the lever 26 carries an antifriction roller 29, which is adapted to be moved into engagement with a cam member 30, carried by the bracket 9, before referred to.

When the parts are in operative position, shown in dotted lines in Fig. 1, the lever 26 is moved to a position in which its antifriction roller 29 is entirely away from the cam member 30. As the gun is swung around toward operative position, the movement of the parts, including the rotary movement of the arm 28, will bring said roller 29 into the position shown in Fig. 3, in engagement with said cam member 30, when the gun is in the position shown in full lines in Fig. 3. The continued swinging movement of the gun and boom to operative position moves said lever 26 to the position shown in dotted lines in Fig. 3, the roller 29 riding outwardly on the cam member 30, as the arm 28 turns with the shaft 8, thereby tending to shorten the flexible member 24 and slacken the flexible member 20. This tilts the gun to depress its nozzle into clay-discharging position, as shown in Fig. 2.

The numeral 31 designates the actuating cylinder for the gun-holding mechanism 32, 32ª, which may be, in general, of the form shown in the Berg patent. The boom 7 may be swung by any suitable means. In the drawing, I have shown the shaft 8 as provided with a pulley 33, at its upper end adapted for actuation by a belt, not shown, from any suitable source of power.

When the gun is moved backwardly to its inoperative position, the action is the reverse of that just described, the gun being tilted back to its substantially horizontal position and swung back to its inoperative position.

The advantages of my invention result from the provision of means whereby the angular relation of the gun and boom may be changed to thereby modify the path of movement of the gun as it is swung into and out of operative position. Also from the provision of mechanism such as described for automatically effecting the tilting of the gun into and out of its clay-discharging position.

I do not desire to limit myself to the particular construction, arrangement and combination of parts as shown and described, as it is obvious that various changes may be made without departing from the spirit and scope of my invention as defined in the appended claims. Thus, the precise arrangement and mode of operation of the modifying or compensating mechanism for changing the angular relation of the gun and boom may be varied, any suitable means may be employed for swinging the parts into and out of operative positions, and the details of the operating mechanism may be changed.

I claim;

1. Clay gun operating mechanism comprising a horizontally swinging carrier, a clay gun supported therefrom in a manner to permit independent movement of the gun in horizontal and vertical planes, and means for modifying the path of travel of the gun in a horizontal direction by changing the angular relations between the gun and the carrier, substantially as described.

2. Clay gun operating mechanism comprising a swinging carrier, a clay gun supported from said carrier and capable of independent movement in horizontal and vertical planes, and a member connected to the gun and to a fixed point eccentric to the center of movement of the carrier and acting upon the gun to modify its path of movement when swung by the carrier, substantially as described.

3. Clay gun operating mechanism comprising a horizontally swinging boom, a bracket rotatably swiveled to said boom, and a clay gun pivotally mounted on said bracket to swing in a horizontal direction, and means whereby as the bracket and gun are swung by the boom, the gun will be also swung in a horizontal direction on its pivotal connection with the bracket, substantially as described.

4. Clay gun operating mechanism comprising a horizontally swinging boom, a bracket rotatably swiveled to said boom, and a clay gun pivotally mounted on said bracket, together with a member connected to said bracket and to a point which is ec-

centric with respect to the center of movement of the boom, substantially as described.

5. Clay gun operating mechanism comprising a horizontally swinging boom, a member swiveled to said boom for rotary movement, a gun loosely engaged by said member, and a link connected to said member and to a fixed point which is eccentric with respect to the center of movement of the boom, substantially as described.

6. Clay gun operating mechanism comprising a horizontally swinging carrier, a clay gun supported therefrom in a manner to permit independent movement of the gun in horizontal and vertical planes, and means for modifying the path of travel of the gun by changing the angular relations between the gun and carrier, together with a member connected to said bracket and to a point which is eccentrie with respect to the center of movement of the boom, substantially as described.

7. Clay gun operating mechanism comprising a horizontally swinging boom, a clay gun carried by said boom, a flexible member connected to the gun, and a lever device also connected to said flexible member and mounted to be moved by the movement of the boom, substantially as described.

8. Clay gun operating mechanism comprising a horizontally swinging carrier, a clay gun tiltably supported by the carrier, a flexible member connected to the gun, a lever device to which said flexible member is also connected and which is fulcrumed to a member which is moved by the movement of the carrier, and a cam device coöperating with said lever, substantially as described.

9. Clay gun operating mechanism comprising a horizontally swinging boom, a member swiveled to said boom for rotary movement about a substantially vertical center which is eccentric with the center of movement of the boom, a clay gun tiltably supported by said member, means for rotating said member as the boom and gun are swung, and means for tilting the gun into and out of its clay-discharging position, substantially as described.

10. A clay gun operating mechanism comprising a swinging carrier, a clay gun loosely supported thereby to swing therewith, and means whereby as the gun is swung in a horizontal direction by the carrier, it is also moved in a horizontal direction about another substantially vertical axis, substantially as described.

11. In clay gun mechanism, a clay gun mounted to move in a horizontal direction about a substantially fixed vertical axis and also to move in a horizontal direction about a movable axis, and means whereby as the gun is moved about its fixed axis, it is also moved about its movable axis, substantially as described.

12. In clay gun-operating mechanism, the combination with a carrier mounted to swing in a horizontal direction about a fixed axis, of a gun mounted on the carrier to swing therewith and also to swing on the carrier both in a horizontal and a vertical direction, and connections whereby as the carrier and gun are swung about said fixed axis, the gun is also moved both horizontally and vertically with respect to the carrier, substantially as described.

In testimony whereof I have hereunto set my hand.

EDGAR E. BROSIUS.