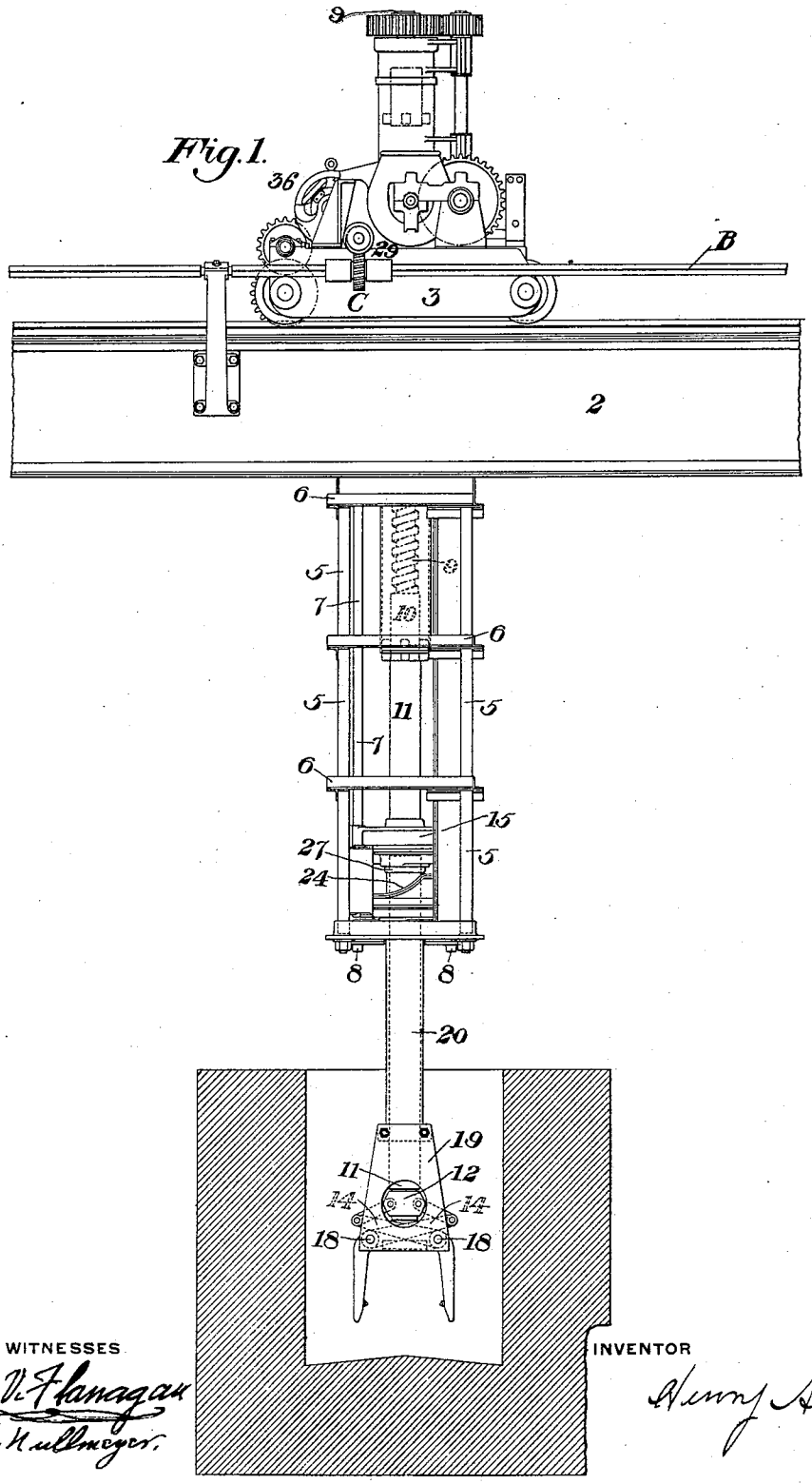
(No Model.) 5 Sheets—Sheet 1.

H. AIKEN.

TONGS OPERATING APPARATUS.

No. 564,041. Patented July 14, 1896.

Fig. 1.



WITNESSES

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TONGS OPERATING APPARATUS.

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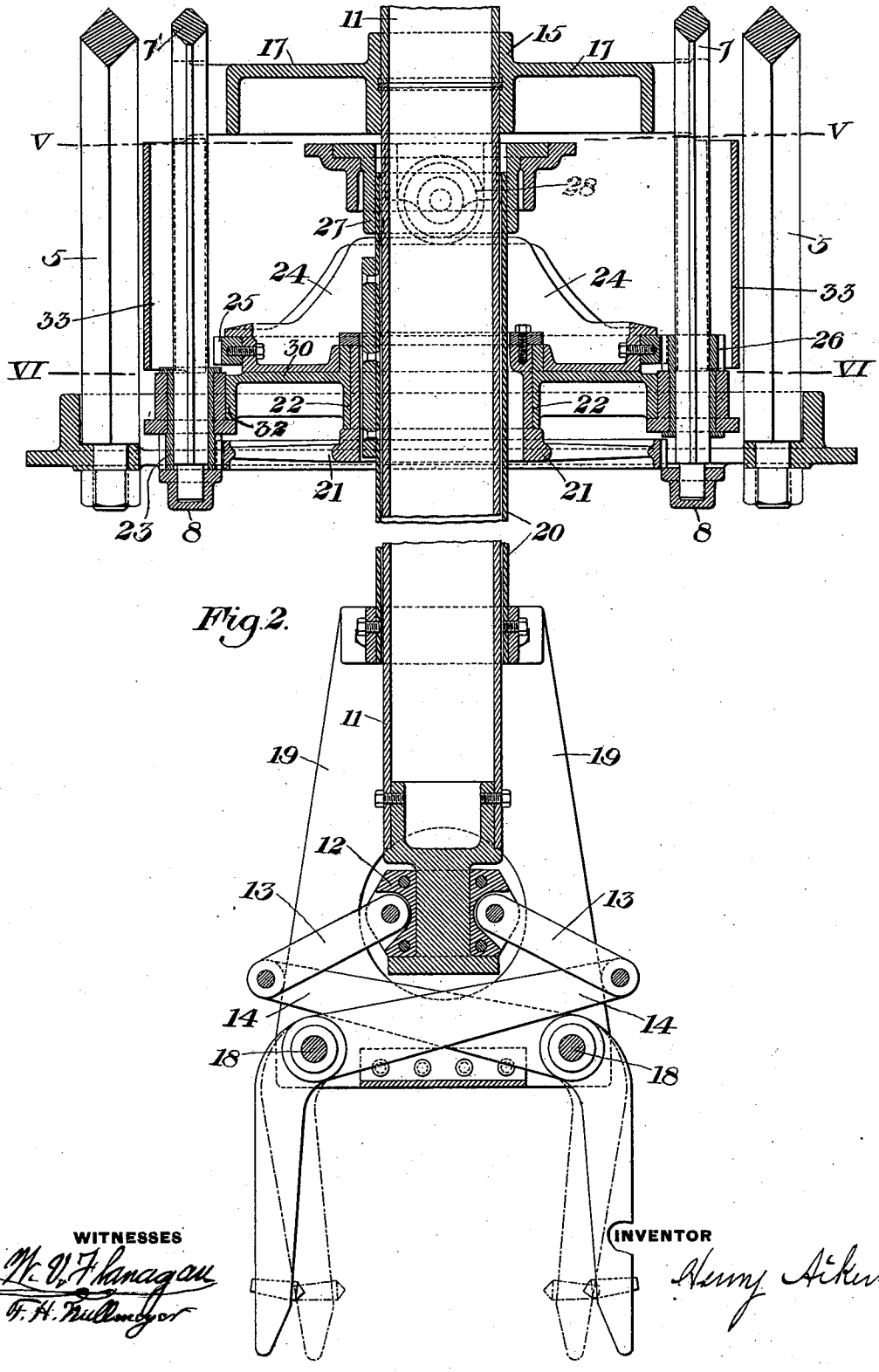

Fig. 2.

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TONGS OPERATING APPARATUS.

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Fig. 3.

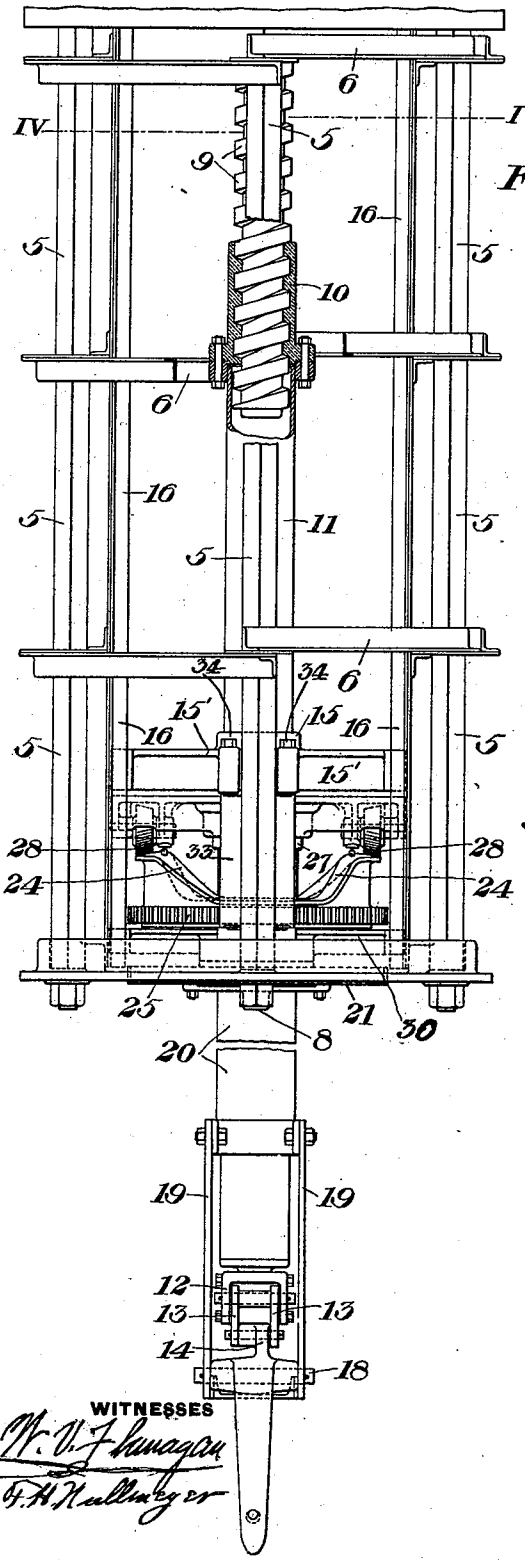
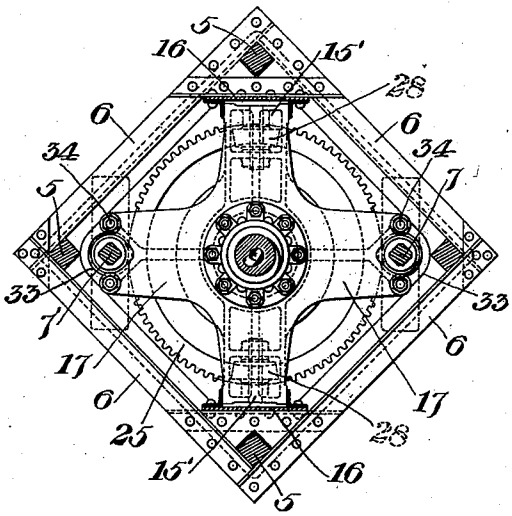


Fig. 4.



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TONGS OPERATING APPARATUS.

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Fig. 5.

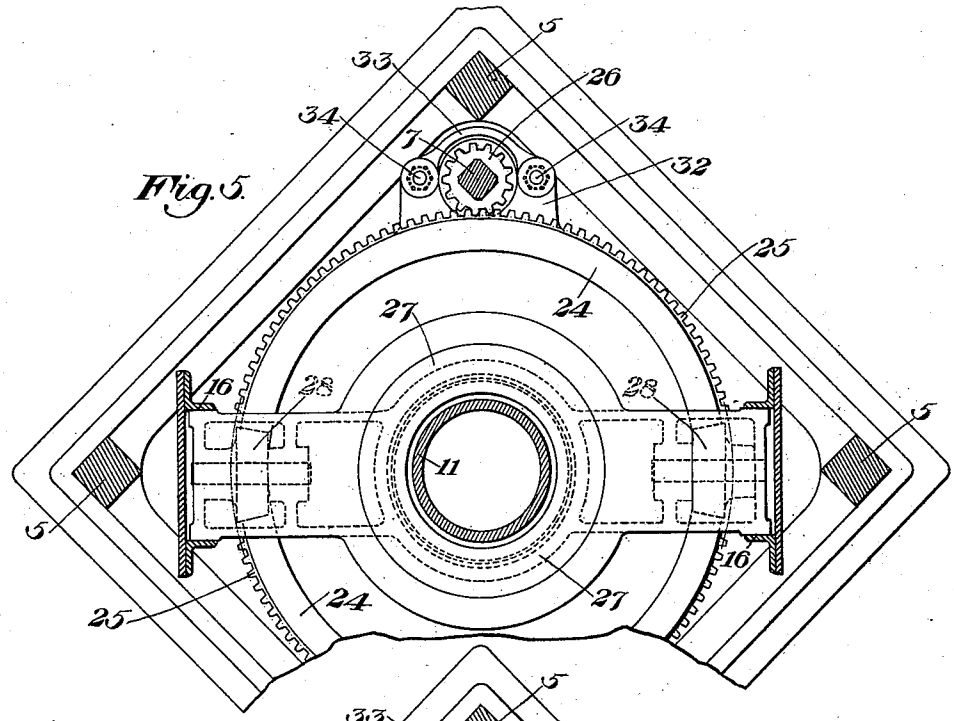
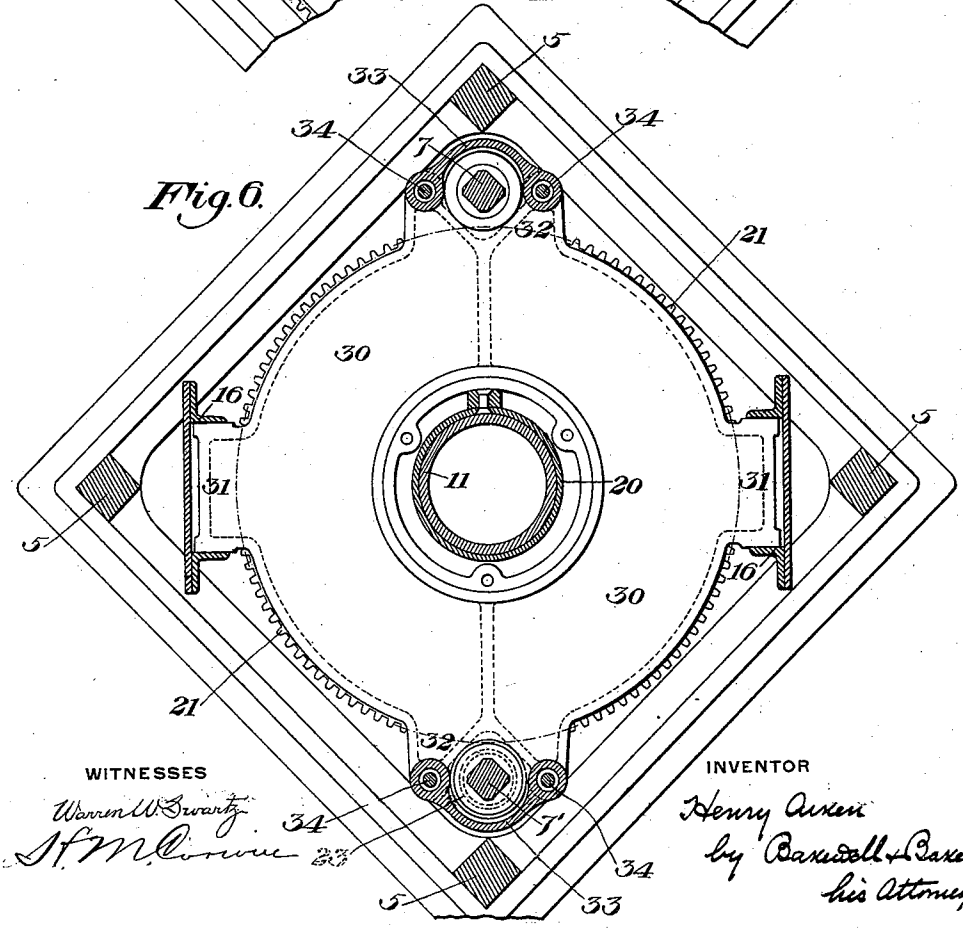


Fig. 6.



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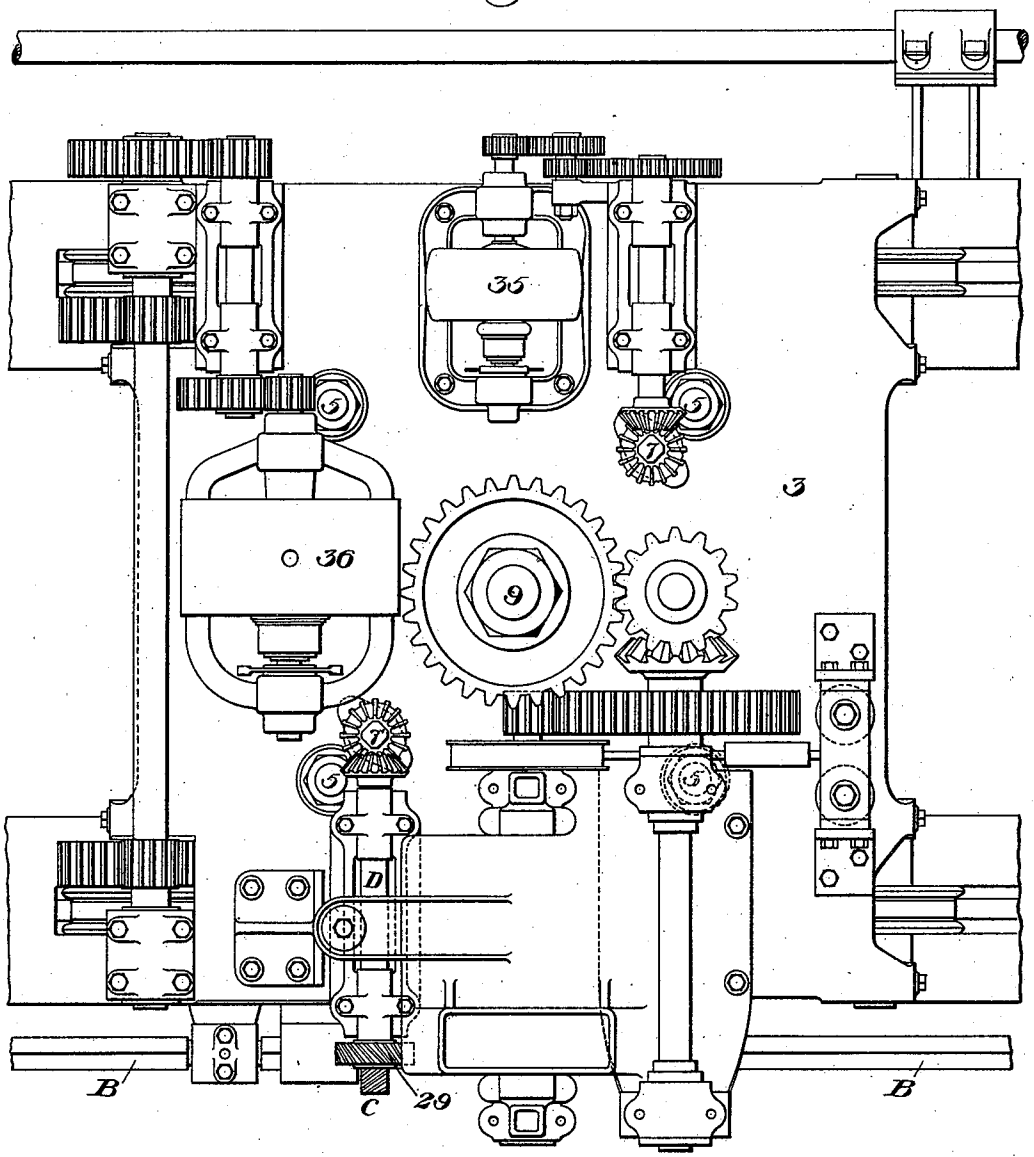
H. AIKEN.

TONGS OPERATING APPARATUS.

No. 564,041. Patented July 14, 1896.

Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF PITTSBURG, PENNSYLVANIA.

TONGS-OPERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 564,041, dated July 14, 1896.

Application filed July 30, 1895. Serial No. 557,651. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Tongs-Operating Apparatus, 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 shows in side elevation a crane provided with my improved ingot-tongs, which are shown inserted into the mouth of a furnace and open. Fig. 2 is a vertical sectional view on a large scale, showing the mechanism for operating the tongs. Fig. 3 is an elevation, partly in vertical section, showing the mechanism of Fig. 2 and also the mechanism which I employ for raising and lowering the tongs. Fig. 4 is a sectional plan view, the section being on the line IV IV of Fig. 3. Figs. 5 and 6 are sectional plan views on the lines V V and VI VI of Fig. 2. Fig. 7 is a plan view of the trolley.

In the drawings, 2 represents the jib or bridge of a traveling crane.

3 is a trolley mounted thereon, preferably carrying a motor 36, by which it may be moved on the jib, and 5 5 are the uprights of a frame which depends vertically from the trolley and have suitable braces 6.

7 7′ are vertical shafts which extend downwardly from the trolley and are stepped at their lower ends in bearings 8, carried by said frame. One of these shafts is driven by a motor 35 and suitable gearing on the trolley and operates the opening and closing mechanism of the tongs, and the other rotates the tongs and is worked by the operator from the platform, connection being made between the operating-stand and trolley by a square shaft B, connected by gearing C and a cross-shaft D with the shaft 7′. As shown in Fig. 1, the gear-wheel 29 on the shaft B, which is connected with the gearing C on the trolley, is a squared hub which travels on said shaft B and maintains operative connection therewith in all positions of the trolley.

9 is a rotary vertical screw-shaft which extends downwardly from a motor on the trolley.

10 is a nut which is fitted on the screw-shaft, so that as the shaft rotates the nut will be moved thereon up or down, and 11 is a tubular post which is fixed to the nut and extends down vertically therefrom, having swiveled at the lower end a head 12, to which are pivoted arms 13, connected, respectively, with the two levers 14 of the tongs. To prevent the post 11 from rotating, but to permit it to move vertically, I fix it to a cross-head 15, having arms 15′, which fit in guideways 16 on the frame 5 6 and having laterally-extending arms 17, which fit loosely around the shafts 7 7′. The jaws of the tongs are pivoted at 18 to a head 19, which at its upper end is fixed to and carried by a tubular sleeve 20, which surrounds the post 11 and is keyed to a gear-wheel 21, set concentrically therewith around the post 11, the hub of said gear-wheel being journaled in bearings 22, fixed to and forming part of a cross-head or plate 30, having arms 31, which fit in the guideways 16, also arms 32, which fit loosely around the shafts 7 7′ and are connected to the cross-arms 17 by vertical plates 33 and bolts 34, which pass through tubular eyes on said plates, as shown in Fig. 6, thus connecting the cross-heads 15 and 30 rigidly together, forming with them a frame and causing them to move in unison.

The gear-wheel 21 meshes with a pinion 23 on the shaft 7′, and as the bearings 22 are fixed to the cross-head 30 they serve to support the several gear-wheels and the mechanism about to be described, and cause them to move vertically with the traveling nut 10. When the pinion 23 is rotated by the shaft 7′, which, as before stated, is rotated by the operator, it rotates the gear-wheel 21 and with it the sleeve 20, which is keyed thereto, so as to turn the head 19 of the tongs on its vertical axis. The shaft 7′ being square and the pinion 23 having a squared hub, the latter is free to move vertically on the shaft without being operatively disconnected therefrom.

For opening and closing the tongs I employ a rotary cam 24, having an upright cam-face and journaled upon the bearing 22, above described. Fixed to this cam is an annular series of gear-teeth 25, meshing with a pinion

26, which pinion has a squared hub and is fitted on the shaft 7, so as to have a traveling connection therewith and to be rotated thereby. At the upper end of the sleeve 20 is fixed a head 27, carrying rollers 28, which bear upon the periphery of the cam 24, so that if the cam be rotated on its vertical axis it will move the sleeve vertically upon the post 11, the sleeve having a feather-and-spline connection with the gear-wheel 21 to permit such vertical motion. When the head 27 and sleeve 20 are at the highest position of the range of motion afforded by the cam, as shown in Fig. 2, they raise the fulcra of the tongs-levers relatively to the head 12, so as to throw the jaws of the tongs open, and if the cam be turned so as to allow the rollers to descend the inclined face of the cam and to lower the sleeve the descent of the head 19, carrying down the fulcra of the tongs, will cause the jaws to close, as shown by dotted lines.

The operation is as follows: By movement of the jib of the crane and by movement of the trolley on the jib the tongs can be carried to any desired position within the range of motion of the crane in the building or other place in which the apparatus is situated. Then, if it be desired to lower the tongs into position to grasp an ingot, the screw-shaft 9 is rotated so as to move down the nut 10 and post 11, and with these parts to carry down the cross-heads 15 and 30 with the supporting-bearing 22, the cam and gear-wheels supported thereby, and the tongs supported at the end of the post. If it be desired to turn the tongs, the shaft 7′ is rotated by the operator so as to turn the gear-wheel 21 and sleeve 20; and, finally, to open and close the tongs, the cam 24 is turned by rotating the shaft 7, the motion of which is transmitted to the cam by the pinion 26 and gear-wheel 25. To raise the tongs, the screw-shaft is rotated in the reverse direction.

The apparatus thus affords a very simple, compact, and strong mechanism for operating the tongs. It affords all the means necessary to grasp an ingot, lift it, and to release it when it has been carried by the crane to the place where it is to be deposited, (the furnace, if it be an ingot to be heated, or the feed-table of a rolling-mill if it be a hot ingot to be rolled.)

Without limiting myself to the precise form and arrangement of the parts which I have shown in the drawings, since these may be varied by the skilled mechanic, I claim—

1. In tongs-operating mechanism, the combination of a non-rotatory post carrying the tongs, a rotatory sleeve on the post, a head which carries the fulcra of the tongs and is secured to the sleeve so as to rotate therewith, a swiveled head 12 on the post, and tongs having jaws pivoted to the first-named head and having arms connecting the jaws to the swiveled head; mechanism for moving the sleeve and post vertically to raise and lower the tongs, and mechanism for rotating the sleeve on the post, substantially as described.

2. In tongs-operating mechanism, the combination of a post, a frame carried thereby, tongs carried by the post, a screw-shaft and nut (one of which is fixed to the post) adapted to move the post vertically, a frame which is carried by the post, and mechanism for turning the tongs and opening and closing the same carried by said frame, substantially as described.

3. In tongs-operating mechanism, the combination of a trolley, a frame depending therefrom, rotatory vertical shafts extending from the trolley and journaled in said frame, a vertically-movable post carrying the tongs, a frame movable vertically with the post, and gearing on the movable frame connected with the tongs, said gearing having traveling connection with said shafts; substantially as described.

4. In tongs-operating apparatus, the combination of a vertically-movable post carrying the tongs, mechanism for moving it vertically, a sleeve on the post carrying a head to which the jaws of the tongs are pivoted, and a cam surrounding the sleeve, said sleeve having a portion which bears upon the cam and is moved thereby, substantially as described.

5. In tongs-operating mechanism the combination of a vertically-movable post carrying the tongs, a sleeve which is vertically movable to open and close the tongs and a cam bearing on the sleeve and adapted to raise the same; substantially as described.

6. In tongs-operating apparatus, the combination of the screw-shaft and nut, the post, a frame carried thereby, a sleeve on the post for turning the tongs, a cam for raising and lowering the sleeve, gearing for turning the sleeve and turning the cam, and a shaft having a traveling connection therewith, said cam and gearing being supported by the frame, substantially as described.

7. In tongs-operating apparatus, the combination of a vertically-movable post carrying the tongs, and a frame carried by the post and constituted by an upper cross-head and a lower cross-head, having an intermediate connection, one of them being fixed to the post, gearing carried by one of the cross-heads and connected with the tongs, and a guide in which the frame moves, substantially as described.

8. In tongs-operating apparatus, the combination of a vertically-movable post carrying the tongs, and a frame carried by the post and constituted by an upper cross-head and

a lower cross-head, having an intermediate connection, one of them being fixed to the post, and gearing carried by one of the cross-heads and connected with the tongs, substantially as described.

9. In tongs-operating mechanism the combination of a post, means for moving it vertically, a sleeve concentric with the post and a rotating pinion and a sleeve-lifting cam also concentric with the post and having driving mechanism; substantially as described.

In testimony whereof I have hereunto set my hand.

HENRY AIKEN.

Witnesses:
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H. D. MESKIMEN.