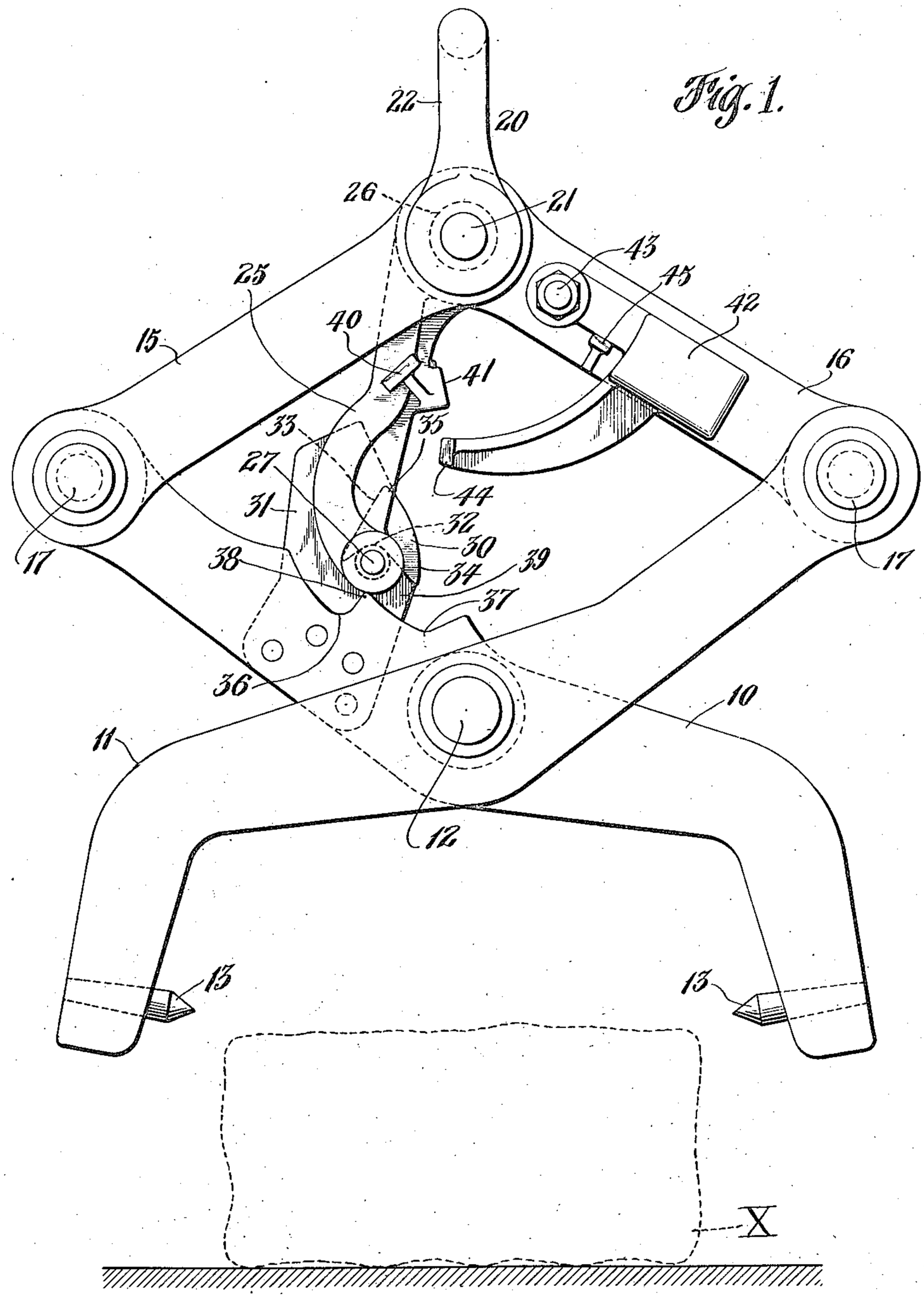
Nov. 18, 1924. 1,516,031

W. M. VENABLE

TONGS

Filed March 21, 1922 4 Sheets-Sheet 1

Fig. 1.



WITNESS

Gustav Genzlinger.

INVENTOR

BY William M. Venable

Symmestvedt & Lechner

ATTORNEYS

Nov. 18, 1924. 1,516,031

W. M. VENABLE

TONGS

Filed March 21, 1922 4 Sheets-Sheet 2

Fig. 1.

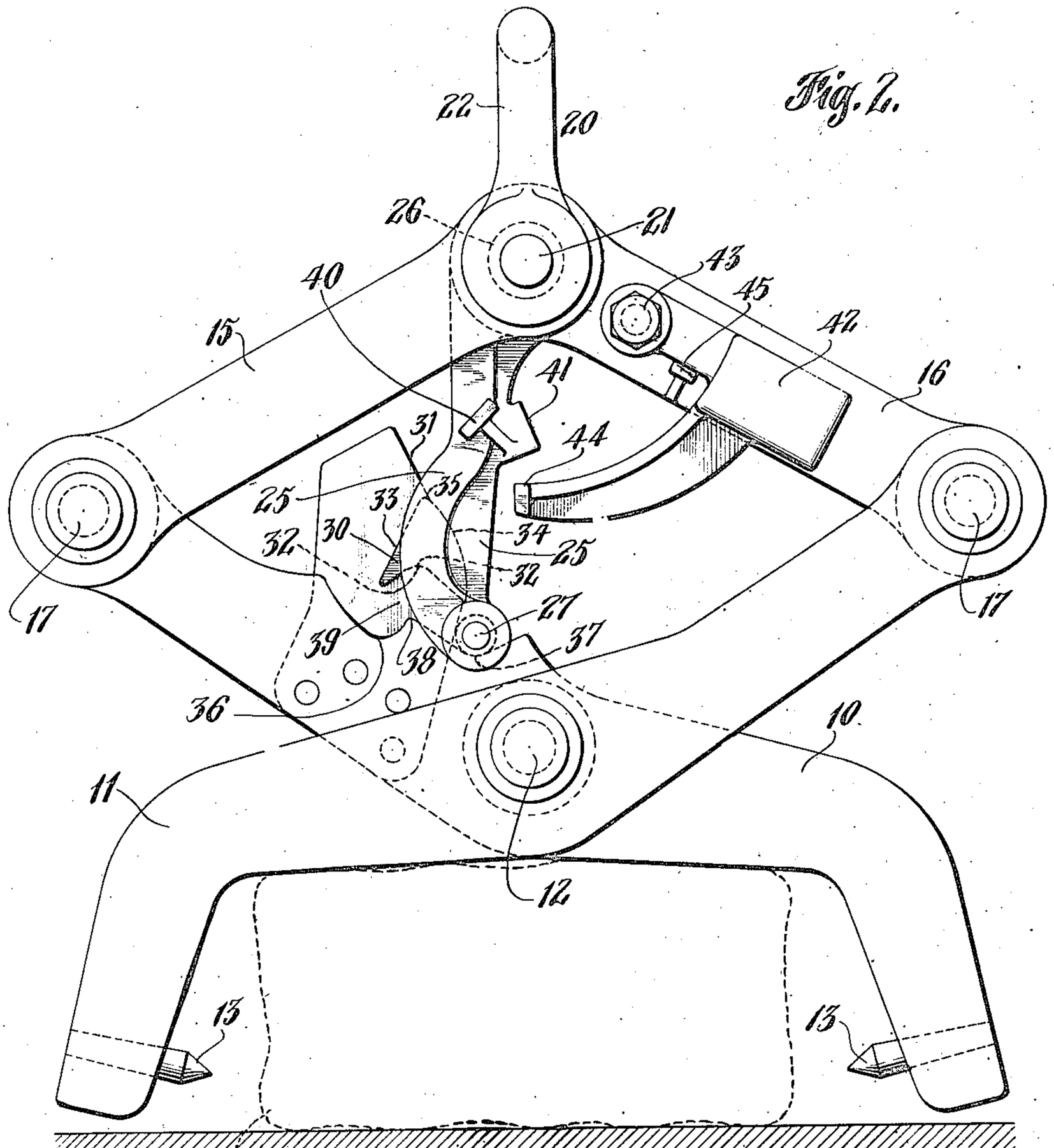
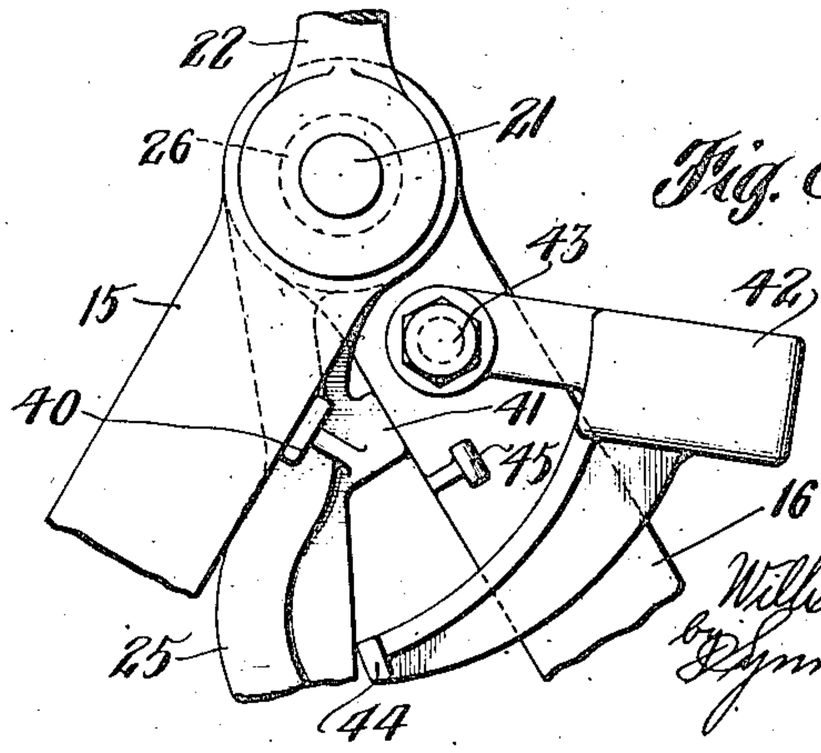


Fig. 8.



WITNESS

Gustav Genzlinger.

INVENTOR

William M. Venable

by Symmes Hyde & Schlechner

ATTORNEYS

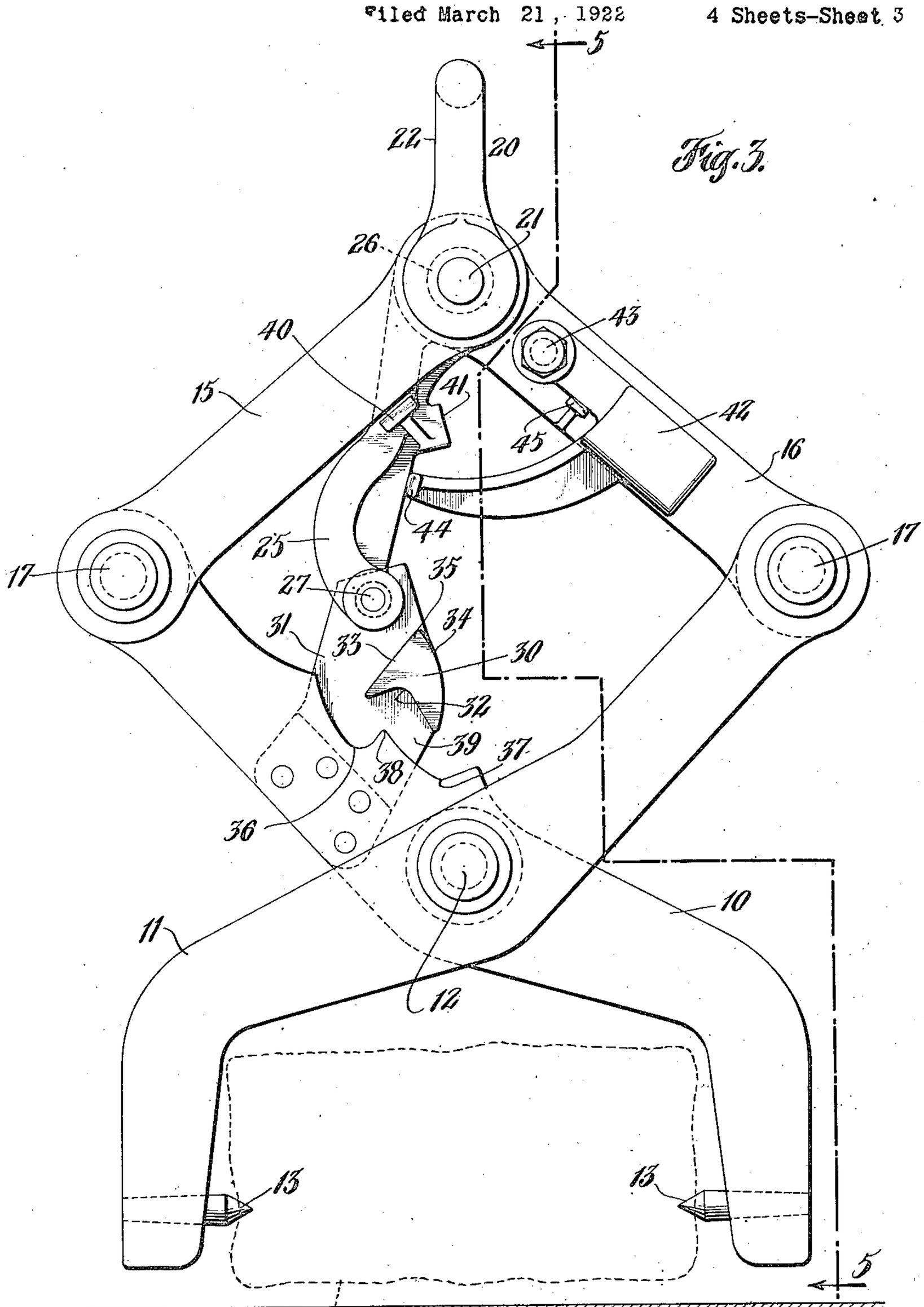
Nov. 18, 1924. 1,516,031

W. M. VENABLE

TONGS

Filed March 21, 1922 4 Sheets-Sheet 3

Fig. 3.



WITNESS

Gustav Genzlinger.

INVENTOR

BY William M. Venable

Symmestvedt & Dechner

ATTORNEYS

Nov. 18, 1924. 1,516,031

W. M. VENABLE

TONGS

Filed March 21, 1922 4 Sheets-Sheet 4

Fig. 6.

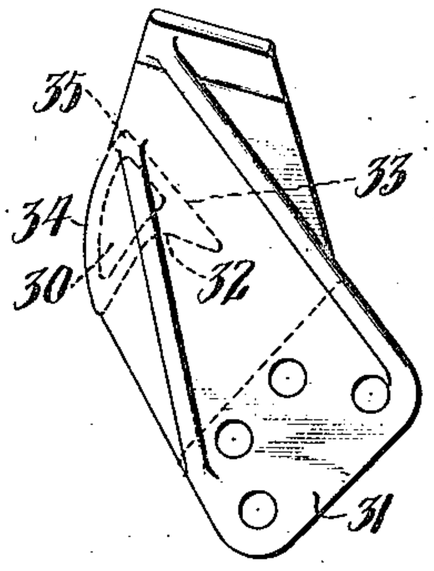
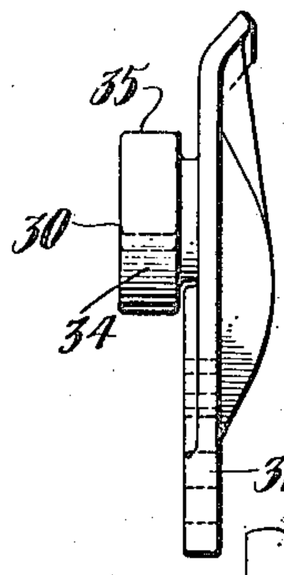


Fig. 7.



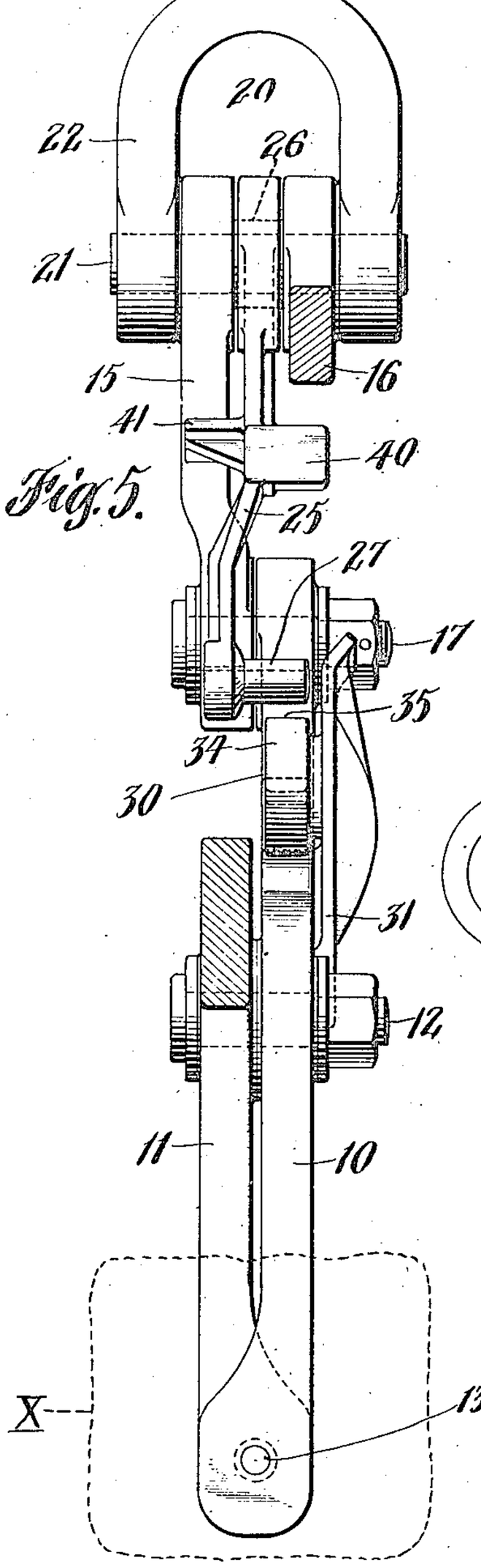
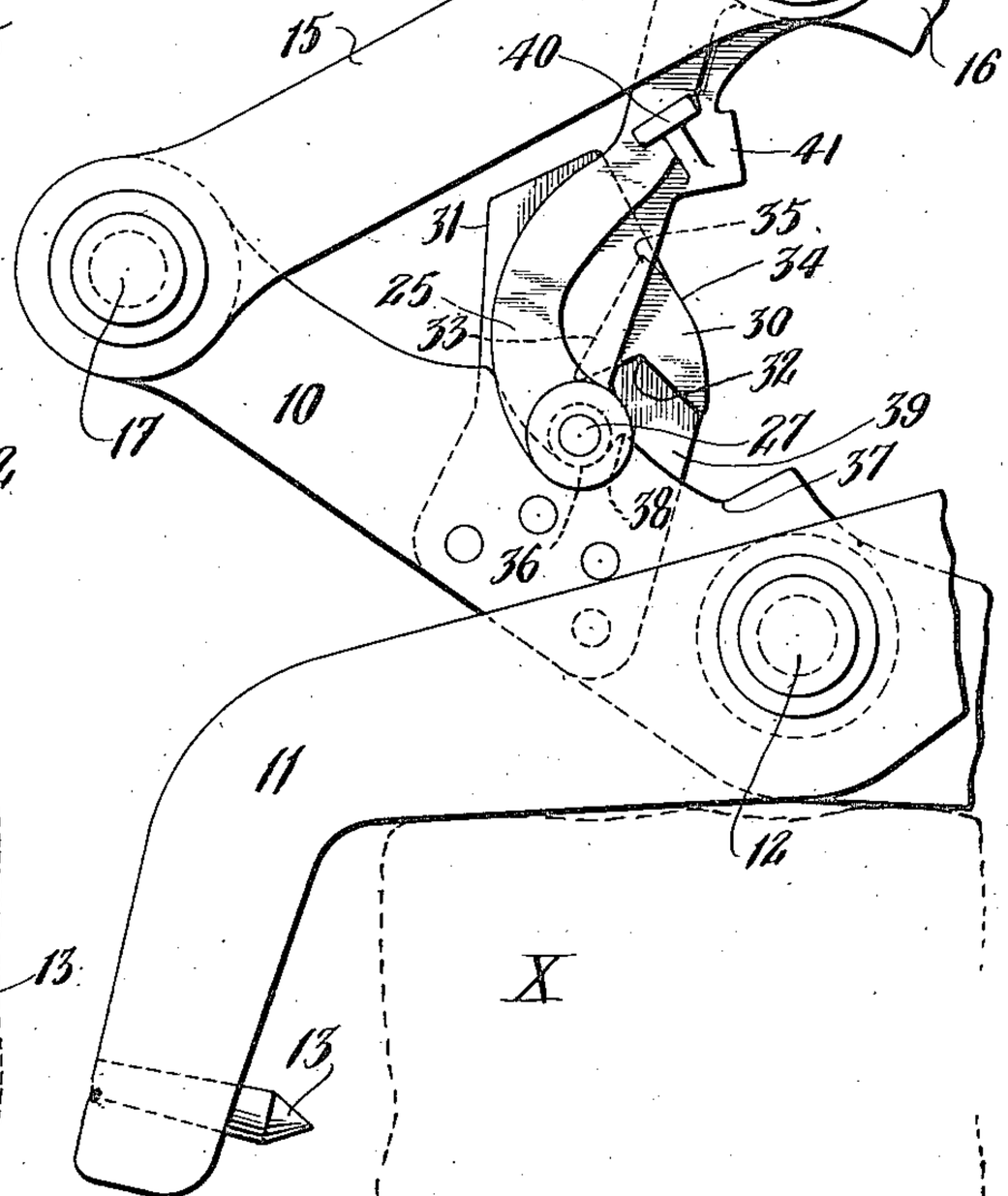


Fig. 5.

Fig. 4.



WITNESS
Gustav Genzlinger.

INVENTOR
William M. Venable
BY Symmestedt & Hechner
ATTORNEYS

Patented Nov. 18, 1924. 1,516,031

UNITED STATES PATENT OFFICE.

WILLIAM M. VENABLE, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO BLAW-KNOX COMPANY, A CORPORATION OF NEW JERSEY.

TONGS.

Application filed March 21, 1922. Serial No. 545,423.

To all whom it may concern:

Be it known that I, WILLIAM M. VENABLE, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Tongs, of which the following is a specification.

My invention relates to tongs and the like, and is applicable with special advantage to lifting tongs employed for handling large, heavy objects or loads while hot,—such as steel ingots, blooms, or billets, etc. I aim to make the tongs effective, reliable, and quick in action, and entirely automatic in operation, so as to obviate the delays and expenses incident to the use of tongs equipped with hand-operated devices for opening them to release an ingot, or for keeping them open while being lowered about an ingot to grapple it. Not only does my invention make it possible to save expense from delays in handling hot metal and from the consequent loss of heat,—and sometimes the services of extra men required to attend to the tongs,—but it also obviates severe discomfort and risk of injury often incurred in operation of the tongs.

How these and other advantages can be realized through my invention will appear from my description hereinafter of the best embodiment of the invention known to me.

In the drawings, Fig. 1 is a side elevation of lifting tongs conveniently embodying my invention, open and ready to be lowered about an ingot;

Fig. 2 is a similar view showing the tongs lowered and resting upon an ingot, ready to close and grapple it;

Fig. 3 is a similar view showing the tongs grasping and lifting or supporting an ingot;

Fig. 4 is a similar fragmentary view showing the tongs lowered upon an ingot so as to release it;

Fig. 5 shows a vertical section through the tongs at right angles to Figs. 1–4, taken as indicated by the line 5—5 in Fig. 3;

Figs. 6 and 7 are rear side and edge views, respectively, of one of the parts shown in Figs. 1–5;

Fig. 8 is a fragmentary side view of the actuating mechanism, illustrating the operation of the tongs.

Referring to Figs. 1–5, it will be seen that the device illustrated comprises a couple of grappling members 10 and 11 interconnected or hinged together by a pivot pin or bolt 12 to form tongs, and provided with points 13, 13 for taking hold on a load,—here represented as an ingot X of suitable dimensions for the tongs shown to handle. These points 13, 13 are preferably made of an alloy steel that will retain its hardness at red heat or upward, in order that they may be fully effective in handling hot steel. Link bars 15 and 16 hinged or pivoted to the upper ends of the members 10 and 11 by pins or bolts 17 connect said arms to a lifting member or device 20, here shown as comprising a pivot pin or bolt 21 with a bail 22 for suspending the tongs from the hook of a crane (not shown), or other lifting means. As shown, the pivot 21 extends through the ends of the bail 20, which straddles the overlapping upper ends of the links 15, 16. By virtue of their pivot connections, the connecting links 15, 16 and the upper arms of the grappling members 10 and 11 form a toggle mechanism for opening and closing the tongs. A pull or lift on the upper toggle half 15, 16 through the lifting member 20 will first close the tongs, if open, and then lift the whole device bodily. When the tongs are lowered upon some object, on the other hand, the weight of the toggle mechanism as a whole tends to open the tongs. In the present instance, the links 15, 16 operate above the horizontal line of the pivots 17, 17 and act to pull the grappling members 10 and 11 shut and to push them open. This arrangement makes practically feasible a much greater range of opening and closing movement for the tongs than if the links 15, 16 operated below the line of the pivots 17, 17, and thus gives the tongs a much wider range of usefulness. It also facilitates the employment of relatively simple mechanism for giving the tongs the desired automatic action.

In the device here illustrated, means are provided for keeping the tongs open while empty, as shown in Fig. 1, ready to be lowered about a load X, and for automatically allowing them to close and grasp such load. For this purpose, there is provided a hanger 25 for connecting the tongs 10, 11 to the upper toggle half. This hanger member 25 is suspended from the lifting member 20, being pivoted about a spacer or "spreader"

bushing 26 on the pivot pin 21, so that it may swing freely relative to the other parts. As shown, the hanger has a somewhat irregular outline, in order that the effect of gravity may tend to swing it to certain positions most favorable to the operation of the whole device. Also the hanger 25 has engagement means in the form of a round pin member 27 projecting laterally from its lower end. For engaging the hanger 25 with the tongs, the latter are provided with engagement means including, in the present instance, a block 30 projecting laterally from a plate 31 itself bolted or riveted fast to one side of the toggle arm of the grappling member 10, and shown in Figs. 5, 6 and 7 as provided with lateral stiffening flanges on its rear face and an inclined strengthening and guide flange at its upper edge. In its lower surface or edge, the block 30 has a recess or concavity 32 for stable engagement of the pin 27 to support the member 10 and hold the tongs open (Fig. 1). The upper surfaces or edges 33, 34 of the block 30 are appropriately shaped to guide and direct the movements of the pin 27 and of the hanger 25, and converge upward to a crest or apex at 35. Besides the guide and engagement means 30, the arm 10 is provided with guide means formed, as shown, by saw-tooth-like recesses or concavities 36 and 37 in its upper edge, separated by a crest or apex 38. The guide 36 helps to direct the pin 27 to the recess 32 from the left (see Figs. 3 and 4) as the pin passes beyond the guide 33 in its downward movement when the tongs are lowered upon their load to open and release it, and also serves as a stop to limit such downward movement of the pin and the opening of the tongs; while the guide 37 helps to direct the pin out of the recess 32 to the right as the pin moves downward when the open tongs are lowered upon a load, and also serves as a stop to limit such downward movement of the pin and the opening of the tongs under these conditions. Together, it will be seen, the block 30 and the guide means 36, 37 afford a tortuous guide and engagement channel 39 for the pin 27, and are automatically effective (as will now be more fully explained) to pass the pin through the channel to hold the tongs open while empty each time the tongs go through their regular cycle of operation.

As thus far described, the device operates as follows:

In the condition shown in Fig. 1,—with the tongs held open by engagement of the hanger 25 with the member 10 by means of the pin 27 and the block 30,—the tongs are lowered about and upon the load X, and allowed to settle down freely and rest upon it as shown in Fig. 2. As a result, the pin 27 drops out of the recess 32 (under the weight of the bars 15, 16 on the hanger 25), strikes the guide 37 to the right of the apex 38, and is deflected and directed further to the right, to the bottom of the recess 37 at the right of the block 30, as shown in Fig. 2. The upper toggle half being no longer connected to the tongs by the hanger 25, the tongs are free and ready to close upon, grapple or grasp, and lift the load X (see Fig. 3) as soon as the device is lifted by a pull on the lifting device 20. During the closing of the tongs, the pin 27 rides upward along the guide 34 till it reaches the apex 35, and then swings freely to the left somewhat past the latter,—somewhere near to the position shown in Fig. 3.

The device being now lowered till the load X rests on the ground and the tongs settle down freely and rest upon it, as shown in Fig. 4, the tongs open and release the load. At the same time, the pin 27 rides downward along the guide 33 till it strikes the guide 36, which deflects and directs it to the right to the bottom of the guide recess, beneath one side of the block recess 32. When, now, the device is again lifted by a pull on the lifting device 20, the pin 27 is deflected and directed to the right to the bottom of the recess 32, so that the hanger 25 becomes effectively engaged with the arm 10 to hold the tongs open and allow them to be lifted clear of the load.

This brings the parts again to the relative positions shown in Fig. 1, and completes the cycle of operations.

It will be seen, therefore, that by the mere motion of the member 25 under the influence of gravity and the passive cooperation of the various guide and directing means at 30, 36, and 37, (which remain motionless on the toggle member 10) the pin 27 is automatically guided and directed over a closed cycle of movement each time the tongs are lowered upon and raised from loads to release and leave them and to grapple and pick them up,—this cycle including a position of effective engagement of the hanger 25 with the tong member 10 by means of the pin 27 and the block 30. The operation of the tongs is entirely automatic throughout, and as rapid as they can be raised and lowered and moved from place to place. The hanger 25 is alternately brought into engagement and connected with the tongs on the one hand, and disengaged and disconnected therefrom on the other hand,—each time the tongs are lowered upon a load and raised therefrom,—either to release and leave the load, or to grapple and pick it up.

As shown, the hanger 25 has stops 40 and 41 projecting from its opposite sides, for engaging the inner edges of the parts 15 and 16. The stop 40 limits the swing of the hanger arm 25 to the left after it passes beyond the block apex 35, and the stops 40

and 41 together limit the closing of the tongs, by concurrently engaging the two members 15, 16 as shown in Fig. 8. As shown, provision is made for positively throwing the hanger 25 to the left past the block apex 35, by means of a weighted deflector 42 pivoted to the bar 16 at 43, and provided with a guide lug 44 for engaging the hanger edgewise at the right. The movement of the deflector 42 to the left is limited by a stop lug 45 projecting laterally from the bar 16. When the tongs are well open, as in Figs. 1 and 2, the guide 44 does not reach the hanger 25, and hence does not interfere with its movement to the right to disengage the pin 27 from the channel 39. As the tongs close, however, the guide 44 strikes the hanger 25 and presses and deflects it back to the left as far as the engagement of the pin 27 with the block guide 34 will permit yielding and shifting, however, so that the pin 27 may return along the guide 34 to the other side of the block 30. Indeed, when the pin rides past the block apex 35, the deflector 42 here shown automatically directs and swings the hanger 25 on over to the left (faster than it would otherwise go) to a position such as shown in Fig. 3, where the pin 27 is well to the left of the apex 35, ready to descend along past the block guide 33 into the guide recess 36.

While, therefore, the addition of the parts 40, 41, 42, 43 to the rest of the mechanism is not necessary, it will be seen that they tend to improve and quicken the action in various ways.

The practical and absolutely automatic capacity of the tongs ranges, it will be seen, from the distance between the grapple points 13 when the tongs are held open by the hanger 25, as shown in Fig. 1, to the limit of closing determined by the location of the stops 40, 41, as indicated in Fig. 8. This latter limit is determined solely by the consideration that the mechanism may foul itself or become deranged if the tongs close too far. By a suitable design and proportioning of the parts, such as shown, the minimum capacity can in practice easily be made half the maximum.

I claim:

1. A device of the character described comprising interconnected grappling members; a lifting member with connections to said grappling members for pulling them shut when lifted; and means for automatically keeping them open while empty and automatically allowing them to close and grasp a load.

2. A device of the character described comprising interconnected grappling members; a lifting member with connections to said grappling members for pulling them shut when lifted; and means for keeping them open when empty and allowing them to close and grasp a load automatically actuated by lowering them upon a load and by raising them.

3. A device of the character described comprising interconnected grappling members; a lifting member with connections to said grappling members forming with them a toggle mechanism for closing the tongs when lifted; and means for automatically keeping the tongs open when empty and automatically allowing them to close and grasp a load, comprising a single movable member, and passive means, fixed motionless on a member of the toggle, cooperating as aforesaid under the mere influence of gravity on said member itself when the tongs are lowered upon a load or raised therefrom.

4. A device of the character described comprising interconnected grappling members; a lifting member with connections to said grappling members forming with them a toggle mechanism for closing the tongs when lifted; a member for holding the tongs open when empty pivoted to one of the halves of the toggle; and passive means, motionless on the other half of the toggle, for automatically connecting said member therewith and disconnecting it therefrom by virtue of the mere movement of said member under the influence of gravity.

5. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a hanger suspended from said lifting member for holding the tongs open when empty; and means for automatically connecting said hanger with and disconnecting it from the tongs actuated by lowering them upon a load and by raising them.

6. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a hanger suspended from said lifting member for holding the tongs open when empty; and means for alternately engaging said hanger with one of the grappling members and disengaging the same therefrom actuated by lowering the tongs upon a load and by raising them.

7. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member; and engagement means on one of the grappling members for cooperating with said hanger to hold the tongs open when empty, with means for automatically bringing said hanger into and out of engagement with said means, alternately, actuated by lowering the tongs upon a load and raising them.

8. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member; and engagement means on one of the grappling members for cooperating with said hanger to hold the tongs open when empty, with means for automatically guiding said hanger into and out of engagement with said means, alternately, as the tongs are lowered upon and raised from loads to release and leave them and to grapple and pick them up, respectively.

9. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member, and provided with an engagement member; and means for automatically guiding and directing said engagement member over a closed cycle of movement, including a position of engagement with one of said grappling members to hold the tongs open while empty, each time the tongs are lowered upon and raised from loads to release and leave them and to grapple and pick them up.

10. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member, and provided with an engagement member; and means on one of the grappling members affording a guide and engagement channel for said hanger engagement member, and automatically effective to pass said member through said channel, to hold said tongs open while empty, when the tongs are lowered upon and raised from loads to release and leave them and to grapple and pick them up.

11. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member, and provided with an engagement member; and a block on one of said grappling members having an engaging recess for said engagement member in its lower edge and convergent upper guide surfaces, with guide means below said block for automatically directing said engagement member to said recess from one side when the tongs are lowered upon a load to grapple it and out of said recess to the other side when the tongs are lowered upon a load to release it.

12. A device of the character described comprising tongs formed by interconnected grappling members, with engagement means carried by said tongs; a lifting member with connections to said grappling members for closing them when lifted; a hanger suspended from said lifting member, and provided with an engagement member for cooperating with the aforesaid engagement means to hold the tongs open when empty; with means actuated by lowering the tongs upon a load and raising them therefrom for alternately bringing said engagement member into and out of engagement with said engagement means, including a deflector for directing said member to one side of said means for engagement therewith shiftable for return of said member on disengagement from said means at the other side.

13. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member, and provided with an engagement member; and means carried by said tongs affording a guide and engagement channel, with means for automatically passing said member through said channel, to hold the tongs open while empty, including a deflector for directing said member to enter one end of said channel when the tongs are lowered upon a load to release it yieldable to permit return of said member, on exit from the other end of said channel, when the tongs are raised from a load to grapple and pick it up.

14. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member, and provided with an engagement member; a block carried by said tongs having an engagement recess for said engagement member in its lower edge and convergent upper guide surfaces, with guide means below said block for automatically directing said engagement member to said recess from one side when the tongs are lowered upon a load to grapple it and out of said recess to the other side when the tongs are lowered upon a load to release it; and a deflector for directing said engagement member to the first mentioned side of the block apex when the tongs are lowered as aforesaid pivoted to one of the aforementioned parts of the device, and yielding to permit return of said member back to said first mentioned side of the block apex when the tongs are raised after release of the member as aforesaid.

15. A device of the character described comprising tongs formed by interconnected grappling members; a lifting member with

connections to said grappling members for closing them when lifted; a swinging hanger suspended from said lifting member, and provided with an engagement member; a block on one of said grappling members having an engaging recess for said engagement member in its lower edge and convergent upper guide surfaces, with guide means below said block for automatically directing said engagement member to said recess from one side when the tongs are lowered upon a load to grapple it and out of said recess to the other side when the tongs are lowered upon a load to release it; and means for automatically deflecting said hanger and its engagement member back to the first-mentioned side of the block apex when the tongs are raised to grasp a load.

In testimony whereof, I have hereunto signed my name.

WILLIAM M. VENABLE.