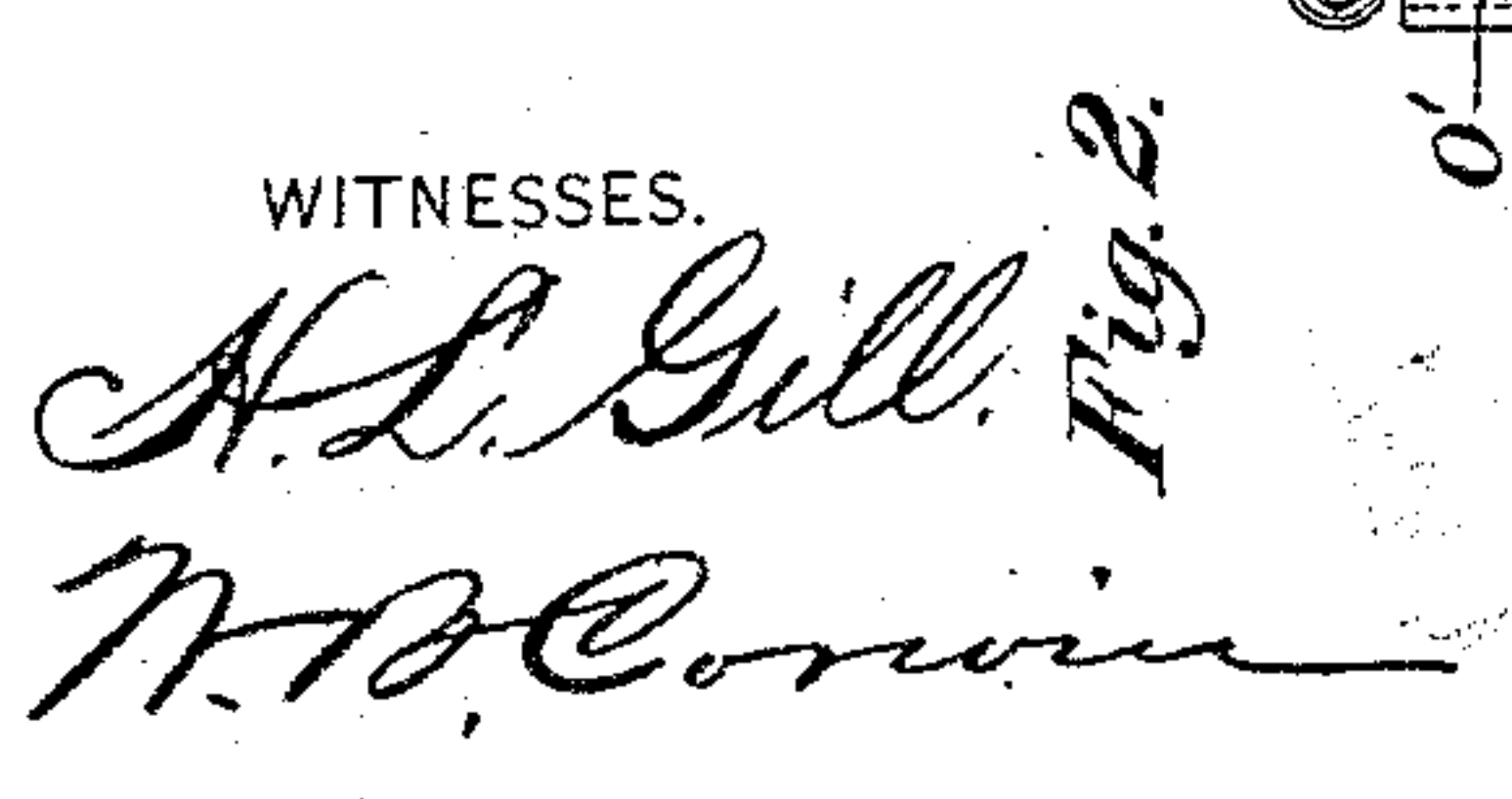


H. AIKEN.  
MILL APPLIANCE.

Patented Apr. 16, 1889.



INVENTOR.

Henry Aiken  
by W. B. Baskin & Sons  
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# UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF HOMESTEAD, PENNSYLVANIA.

## MILL APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 401,325, dated April 16, 1889.

Application filed December 6, 1888. Serial No. 292,816. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY AIKEN, of Homestead, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Mill Appliances; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view of an ingot-crane, showing my improvement. Fig. 1<sup>a</sup> is a plan view of the frame of the tongs shown in Fig. 1. Fig. 2 is a side elevation of a modified form of tongs. Fig. 3 is a plan view of the frame in which the jaws of the tongs of Fig. 2 are pivoted.

Like symbols of reference indicate like parts in each.

My invention relates to an improvement in lifting devices, and has been devised especially for use in the lifting of steel ingots from or placing them in soaking pits or furnaces. I shall so describe it, premising, however, that in so doing I do not intend to limit the scope of the invention to any particular use or uses to which it may be put.

The object of the invention is to provide a lifting device or tongs which may be automatically disengaged from or caused to engage the ingot to be lifted without necessity for adjustment or separation of the jaws by hooked rods in the manner which has been commonly practiced.

The crane shown in Fig. 1 is not in itself a part of my present invention, and may be of any desired construction. I have shown a crane in most features the same as that which was patented to me by United States Letters Patent No. 343,417, which consists of an upright cylinder, V, containing a hollow plunger, a, and having at the base a supply-pipe adapted for the admission of water under pressure, so as to raise the plunger within the cylinder.

U is the mast-frame of the crane, which serves as a vertical guide for the plunger, and is stepped at the base, so as to be axially rotated by means of a suitable hydraulic or other power-engine, U'. The cylinder a is provided with projecting lugs a', which fit against the upright of the mast-frame, so as to allow the plunger to move vertically with-

out producing motion of the mast-frame and cause the plunger to rotate on its vertical axis within the cylinder when the mast-frame is turned. The jib i of the crane is set on the top of the plunger a and moves vertically therewith, and is connected with the mast-frame by suitable braces and guide-pieces, as shown in the drawings, so that the jib may move vertically freely with the plunger and may rotate therewith when the mast-frame is rotated. The advantages of this construction of the crane are fully set forth in my said Patent No. 343,417, and need not be repeated here.

The tongs which form the means for grasping the ingot are suspended from the jib of the crane by chains or other equivalent suspending device, preferably in the following manner: Two of the chains, m m, are attached directly to the jib, and the other chain, s', is attached to the projecting arm s of the plunger r of a hydraulic cylinder, R, which is set in suitable supporting-brackets, R', on the jib. The plunger of this cylinder is adapted to move vertically within its cylinder, which is supplied with water, preferably, by a pipe, p, which leads from the hollow plunger a of the crane along the jib to the cylinder R, and is provided with a valve, q, by means of which the flow of water into the cylinder R and its discharge therefrom may be controlled, though, if desired, the water-connections may be otherwise arranged. The stem of the valve q is preferably operated by a connecting-rod, v', which is attached to a crank-arm, v, of a vertical shaft, w, which is square or polygonal in cross-section. The shaft w is journaled in horizontal brackets w<sup>2</sup>, which project from the mast-frame U, and is provided with a suitable hand-lever, w', for turning it, so as to move the stem of the valve q in the proper manner. The crank-arm v is fixed to an externally-tubular sleeve, v<sup>2</sup>, which is square internally in cross-section and encircles the shaft w. The sleeve is journaled in a bracket, w<sup>3</sup>, which projects from the jib of the crane, so that as the jib moves vertically with the plunger a the sleeve will slide on the shaft, and will always preserve operative relation therewith. Instead of making the shaft w square in cross-section, it may be otherwise constructed and connected with the sleeve



by a feather and spline, or in any other suitable way.

I shall now describe the construction of the tongs with reference to that form which is shown in Fig. 1. They consist of two lever-arms,  $n n' n^2 n^3$ , which are preferably bent into the angled form shown in the drawings, and for the purpose of enabling them to have a wider grasp are preferably pivoted separately to a cross frame or bar,  $b$ . The preferable construction of this cross-frame is shown in Fig. 1<sup>a</sup>. It consists of an open frame having separated side bars, and at the middle provided with upwardly-projecting suspending-arms  $o^2$ , which are connected by a bolt or rivet,  $o^3$ , to which the chain  $s'$  is attached.

The arms  $n n' n^2 n^3$  are set between the side bars of this frame, being pivotally secured thereto by bolts or rivets  $o'$ , and the chains  $m m$  are attached to the ends of the arms  $n n^2$ . At the ends of each of the parts  $n' n^3$  of the tongs is a tooth or projection,  $c$ , to enable the tongs to grasp firmly the sides of the ingot or other object intended to be raised.

The operation of the tongs is as follows: Normally the tongs hang from the jib of the crane, suspended by the chain  $s'$ , and the gravity of the arms  $n n^2$  of the tongs is such as to cause the gripping portions or arms to remain spread or open, as shown in the drawings. When it is desired to raise an ingot which may be in a soaking pit or furnace,  $d'$ , the crane is moved so as to bring the jib directly over the same, and the crane is lowered until the separated jaws  $n' n^3$  lie on opposite sides of the ingot. The plunger  $r$  of the hydraulic cylinder is now lowered by exhaustion of the water from the cylinder by means of the valve  $q$ , the effect of which is to cause the weight of the tongs to be borne by the chains  $m$ , which, acting on the ends of the arms  $n n^2$ , tend to raise them into an upright position, and thereby to close the jaws  $n' n^3$  upon the ingot, and if the jib of the crane be raised these jaws, biting upon the ingot and clasping the same firmly, will lift it from the pit. The jib of the crane may now be moved to carry the ingot to the place desired—for example, to the conveying-rolls or feed-table of a rolling-mill—and when the jib has been lowered the tongs may readily be released from the ingot by admitting water into the cylinder  $R$ , thereby elevating the plunger  $r$  and causing the chain  $s'$  to draw upon the cross-bar or frame  $b$ . The effect of this is to take the weight of the tongs off the chains  $m$ , and the arms  $n n^2$ , being thus relieved, will drop by gravity, so as to disengage the jaws  $n' n^3$  from the ingot. The tongs are thus released automatically, and may be removed from the ingot by shifting the position of the jib of the crane. The advantages of the invention will be appreciated by those skilled in the art who are familiar with the annoyance occasioned by the labor of adjusting and releasing the tongs heretofore commonly employed for like purposes. The use of the tongs results in a

saving of this labor, it avoids the necessity of the workman approaching closely to the highly-heated ingot, and is otherwise a valuable and economical appliance. The use of the tongs in carrying ingots to and placing them in soaking-pits will be readily understood from the foregoing description.

By the particular description which I have given of the construction of the tongs I do not wish it to be understood that my invention is limited strictly thereto, since I believe myself to be the first inventor of tongs, no matter how pivoted or connected, whose jaw-levers are suspended by chains or equivalent devices, and having a separate suspending device from which the tongs may be suspended, so as remove their weight from the jaw-levers and to cause the latter to open, either for the purpose of enabling the tongs to be set on an ingot or removed therefrom.

Within the scope of the invention as thus stated the tongs are susceptible of various modifications in construction and in the manner in which they may be operated. Thus in Figs. 2 and 3 I illustrate one of such modifications. In this form of the apparatus the construction of the tongs is similar to that shown in Fig. 1, except that the angular form of each of the arms  $n n' n^2 n^3$  is or may be more nearly a right angle. The side bars of the cross-frame  $b$  are or may be connected at the ends to give greater strength thereto. The chains  $m m$  and  $s'$ , instead of extending directly to the jib of the crane, may be attached to a ring or link,  $d$ , at the end of a chain,  $e$ , which is attached either directly to the jib or to a trolley thereon. The chain  $s'$  is provided with a hook,  $s^2$ , at its lower end, by which it may be detachably secured to an eye or ring,  $f$ , at the extremity of the projecting arm  $o^2$ .

The operation of this form of tongs is as follows: Normally the chain  $s'$  is attached to the eye  $f$ , and the weight of the tongs, as it hangs from the crane, is borne by this chain, so that the arms  $n n^2$  are free to drop by gravity and hold the jaws open, as shown in Fig. 2. The tongs may now be brought by movement of the crane directly over the ingot, and as the jaws are open the crane may be lowered to cause the cross-bar  $b$  to rest on top of the ingot and the jaws  $n n'$  to straddle the same. (See Fig. 2.) If, now, the hook at the end of the chain  $s'$  be disengaged from the eye  $f$  by means of the usual hooked rod, the weight of the tongs is put upon the ends of the arms  $n n^2$ , and if the crane be raised the jaws of the tongs will bite upon and hold the ingot, as will be readily understood. When the ingot has been carried by the crane to the place desired and is deposited upon the ground, the consequent slacking of the chains  $m m$  and the weight of the arms  $n n^2$  will cause the latter to drop, so as to open the jaws of the tongs, and then if the hook at the end of the chain  $s'$  be attached to the eye  $f$  the crane may be raised or moved away from the ingot,



the tongs being held open for this purpose by the chain *s'*.

This form of the apparatus may not be so well adapted for some purposes as the form shown in Fig. 1, because it does not afford means for automatically closing the tongs; but as it is adapted to hold the tongs open, so as to enable them to be adjusted in position on the ingot without manipulation other than movement of the crane, it is of great utility, as it dispenses with the work of pulling into position the tongs themselves, which may be of great weight, and requires only the inconsiderable labor of attaching or detaching the chain *s'* from the tongs.

In some cases it may be desirable to render the tongs adjustable, so that they may have a wider or narrower grasp, in order to accommodate them to the size of the ingots to be carried. For this purpose I may provide the cross-frame *b* with several pairs of bolt-holes for the pivotal bolts *o'*, as shown in Fig. 2, and by setting these bolts nearer to the middle of the tongs the jaws may be brought more closely together and their width of grasp thereby adjusted. The pivots of the jaws may be brought as closely together as desired for the class of work which the tongs are designed to perform, and by suitable modifications in the form of the jaws it is possible to set both on the same pivot.

From the foregoing description it will be apparent that the tongs are susceptible of other modifications. In the form shown in Figs. 2 and 3 the hydraulic appliances on the jib of the crane are unnecessary to be used, and in the form shown in Fig. 1 they may be replaced by other suitable power appliances.

I claim—

1. Tongs having gripping-jaws, a chain or supporting device by which the tongs may be suspended without exerting a closing action on the jaws, and a second supporting device—such as chains—connected with the jaws and acting thereon to close the same when the tongs are suspended therefrom, substantially as and for the purposes described.

2. Tongs having gripping-jaws, a chain or supporting device by which the tongs may be suspended without exerting a closing action on the jaws, a second supporting device—such as chains—connected with the jaws and

acting thereon to close the same when the tongs are suspended therefrom, a crane from which the tongs are suspended, and power devices on the crane connected with the tongs, whereby the weight of the tongs may be shifted from one of said supporting devices to the other to cause the tongs to open or close, substantially as and for the purposes described.

3. Tongs having arms forming jaws and levers, a cross bar or frame connecting the jaws, and a lifting device connected with the cross bar or frame, substantially as and for the purposes described.

4. As an improvement in ingot-tongs, the combination of a crane having a cylinder at the outer end of the jib, a pipe conveying motive fluid from the motive-fluid supply of the crane to the cylinder, and tongs which are connected with and operated by the moving parts of said cylinder, substantially as and for the purposes described.

5. As an improvement in devices for transporting ingots and like articles, the combination of a crane having a lifting-cylinder and plunger, fluid-power connection between the crane-plunger and the lifting-cylinder, and a valve operated by a vertical shaft, to which the valve is connected by a traveling connection, substantially as and for the purposes described.

6. Tongs having pivotally-movable jaws and a cross-frame in which the jaws are pivoted, said cross-frame being constructed to afford for the jaws a number of pivots more or less remote from the center to permit the relative positions of the jaws to be varied, substantially as and for the purposes described.

7. Tongs having jaws pivoted on separated pivots, substantially as and for the purposes described.

8. Tongs having pivotally-movable jaws and a cross bar or frame constituted of separated side pieces or bars, between which the jaws are pivoted, substantially as described.

In testimony whereof I have hereunto set my hand this 15th day of November, A. D. 1888.

HENRY AIKEN.

Witnesses:

W. B. CORWIN,  
J. K. SMITH.