

(No Model.)

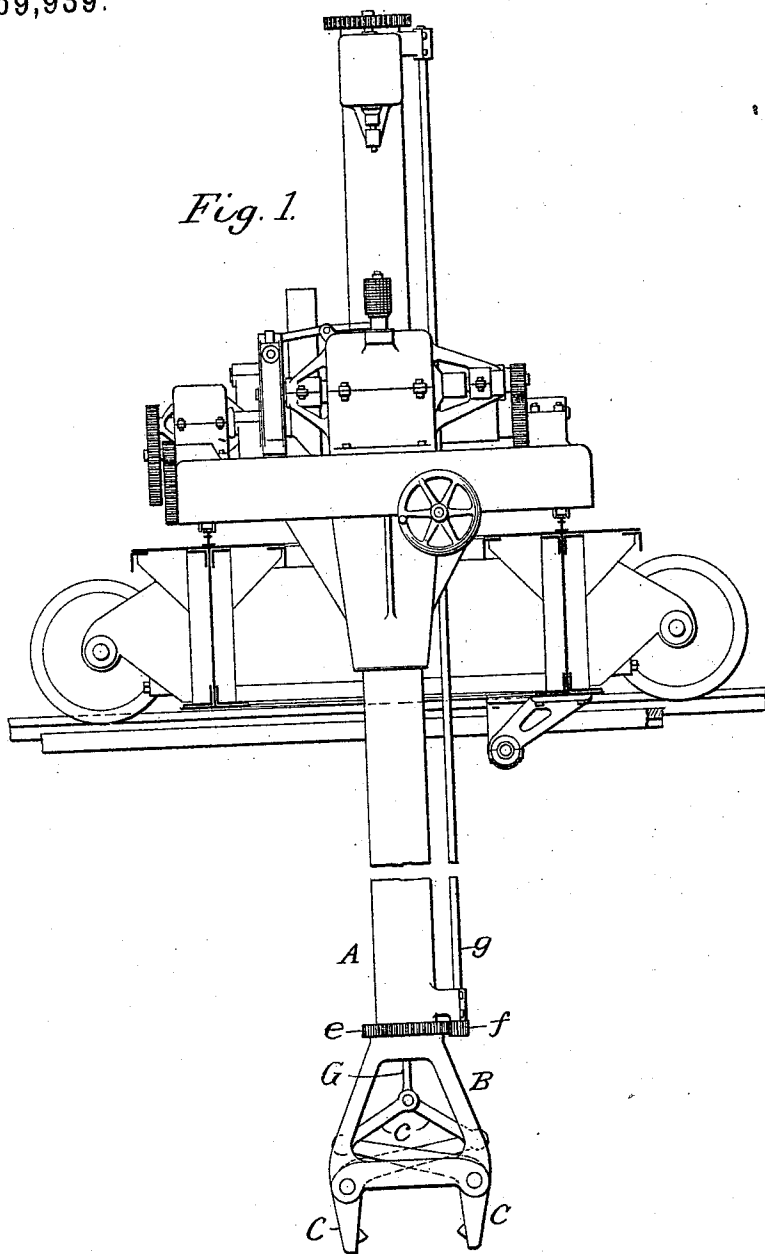
2 Sheets—Sheet 1.

H. SAWYER.
TONGS OR GRAPPLES.

No. 569,939.

Patented Oct. 20, 1896.

Fig. 1.



Attest:

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Inventor,

by Dodge Stone,

Att'y.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

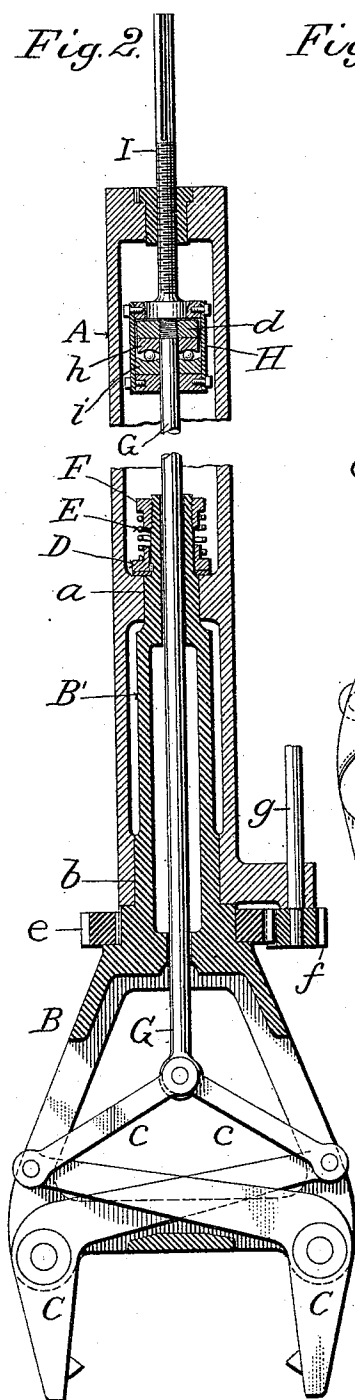


Fig. 3.

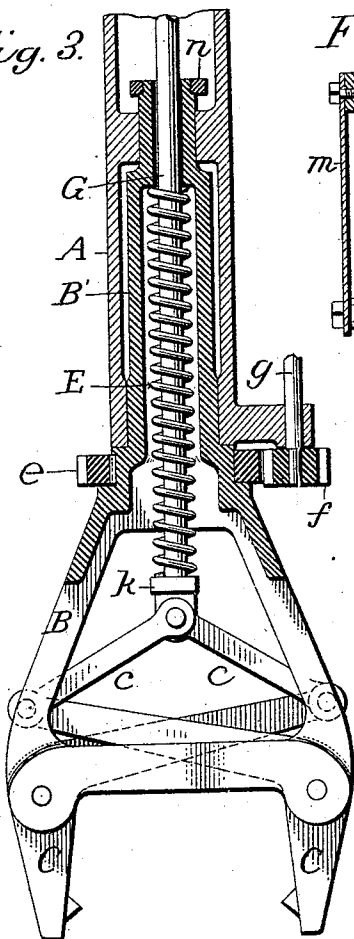


Fig. 4.

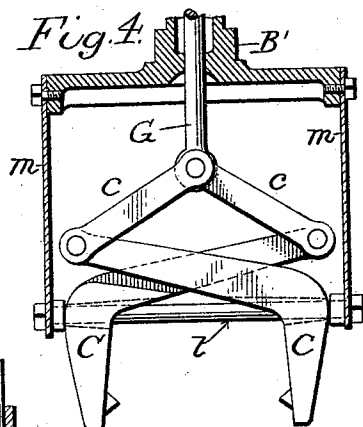


Fig. 5.

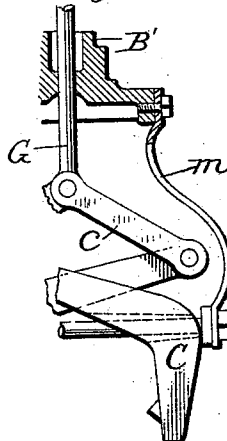


Fig. 6.

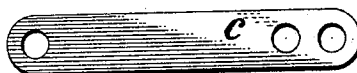


Fig. 7.

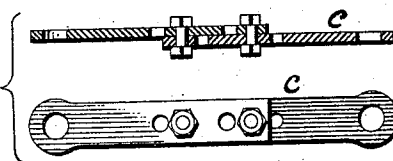


Fig. 8.



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UNITED STATES PATENT OFFICE.

HARRY SAWYER, OF MUSKEGON, MICHIGAN.

TONGS OR GRAPPLE.

SPECIFICATION forming part of Letters Patent No. 569,939, dated October 20, 1896.

Application filed March 18, 1895. Serial No. 542,222. (No model.)

To all whom it may concern:

Be it known that I, HARRY SAWYER, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Tongs or Grapples, of which the following is a specification.

My invention relates to tongs or grapples such as are used for handling ingots and performing like work.

The invention consists in a novel construction and arrangement of parts whereby I am enabled to secure in the one structure the advantages incident to two previous types of construction while avoiding the objections thereto.

In the accompanying drawings, Figure 1 represents an elevation of a trolley mounted upon a traveling bridge-crane and provided with my improved tongs; Fig. 2, a sectional view of the tongs in their preferred form; Fig. 3, a similar section showing a modification; Figs. 4 and 5, sectional views illustrating other modifications, and Figs. 6, 7, and 8 views illustrating certain details hereinafter explained.

For the purpose of better explaining and pointing out the advantages and novel features of my invention a brief general statement will be made as to prior constructions. As at present constructed tongs or grapples may be divided generally into two classes, grappling-tongs or those that grip only by and in proportion to the weight of the load lifted and positively-acting tongs which grip by reason of some force applied independently of the weight of the load. The automatic grappling action of the first-mentioned class and the gripping of a load with a pressure proportionate to the weight thereof is, under many conditions, an advantage, but such tongs are open to the objection that they do not take a firm hold until they commence to lift, and consequently the jaws will sometimes slip and injure themselves or the load before taking a sufficiently firm hold to lift the load. Positively-acting tongs are free from the fault noted, but possess another. If correctly proportioned to grip a load of medium weight, the grip or pressure may be unnecessarily strong for light loads or for comparatively frail objects and insufficient for heavy loads.

With certain types of positively-acting tongs, the jaws being closed upon the object by the straightening of a toggle, it happens that the pressure upon the object lifted is greater as the load is less and, vice versa, least when the load is greatest.

The present invention is designed to bring together in one structure the advantages of the automatic grappling action and of the positive closing or actuation of the jaws, while at the same time eliminating the objectionable features of the prior constructions above outlined.

In Fig. 1 I have represented the tongs as carried in a vertical position by the lifting beam or bar of a hoisting apparatus carried by a trolley movable upon a traveling bridge or girder. This is done merely for purposes of illustration, and because the tongs are primarily designed for use in such connection; but it is to be understood that the invention is wholly independent of any mechanism for hoisting the load or for raising and lowering the tongs, and it may be used with jib-cranes or with trolleys movable over fixed ways or in any other desired relation.

Referring first to Fig. 2, I will explain the construction of my tongs in their preferred form, after which the modifications represented in Figs. 3, 4, and 5 will be explained.

A indicates a hollow bar or beam which will ordinarily be arranged to rise and fall for the purpose of elevating or lowering the load carried by the tongs, which, as will be seen, are in turn carried by the bar or beam A.

B indicates a frame in which are pivoted the levers or jaws C C, constituting the tongs or grappling device proper, said frame being formed with a cylindrical neck or shank B', which is turned true and has bearing at or near its upper and lower ends in properly-bored seats *a* and *b* in the bar or beam A. This construction and arrangement of the frame B and its neck B' permit a rotation of the frame and also a slight longitudinal movement thereof within and relatively to the bar or beam A, both of which motions are required, or at least desirable, in practice.

Above the seat or bearing *a* in the bar or beam A there is placed a collar D, which rests upon the seat or bearing and encircles the reduced upper end of the shank B' of

frame B, to which it is splined, allowing a free longitudinal movement, but preventing rotation of the parts relatively to each other. Resting upon the collar D is a strong spiral spring E, which is confined between said collar and a nut or collar F, screwed or otherwise secured upon the upper end of the neck or shank B'. The spring E is of a strength somewhat more than sufficient to support the weight of the frame B and the parts carried thereby, and consequently it, under normal conditions, sustains such weight.

The tongs levers or jaws C are independently pivoted in the frame B, and their arms are crossed, as shown in Fig. 2. From the upper or outer end of each jaw-lever C a link *c* extends to and connects with a central operating-rod G, which, passing upward through the shank or neck B', terminates in a head or disk *d*. The disk *d* forms one member of a swivel H, which may be of any ordinary construction, but which is preferably of the peculiar construction hereinafter more fully explained. Through the swivel H the rod G is connected with a screw rod or stem I, which, passing through a nut J in the bar or beam A, serves to raise and lower the rod G and thereby to actuate the jaw-levers C through the medium of the links *c*.

Assuming now that it be desired to grasp an object and that the tongs are not sufficiently opened, the screw-rod I is turned in a direction to cause it to descend and thereby to carry down the rod G, which, acting through the links *c*, depresses the long arms of the jaw-levers C and throws their gripping ends apart. The tongs being thus opened are lowered over the object—ingot or other—and the screw-rod I is turned in a reverse direction, thereby lifting rod G and links *c* and throwing the gripping ends of the tongs-levers C together. The gripping force may thus be determined by the extent to which the screw is turned, and it will therefore be seen that the operation is up to this point the same as that of other positively-actuated tongs. As soon as the lifting begins the spring, being insufficient to carry any considerable portion of the load, yields, allowing the shank of frame B a slight downward movement in its bearings and causing the weight of the load to be carried almost entirely by the operating-rod G and screw-rod I. The rod G being connected to the tongs by the links *c*, a pressure of the jaws upon the ingot or other load will be produced nearly in proportion to the weight of the load. From this it will be seen that in grasping the load the tongs act positively, while in lifting they have the grappling action dependent upon and proportionate to the weight of the load.

In lifting a load the weight of which is less than the tension put upon the operating-rod to give the initial grip no weight is thrown upon the frame B, and the spring E is therefore not compressed. The action in such

case is the same as with positively-controlled tongs. In other words, the grip is constant on all loads of less weight than the tension put upon the operating-rod to give the initial grip plus the surplus lifting power of the spring, and on larger loads is proportional to that part of the load not carried by the spring.

It will be seen from the foregoing explanation that the tongs take a firm hold of the ingot without vertical movement of the frame relatively to the load, and consequently avoid the dulling of the points incident to a sliding motion upon the sides of the ingot before the grip becomes sufficient to lift it. It will also be seen that the gripping of heavy loads is proportionate to their weight.

The vertical movement of the rod G may obviously be produced by other means than represented in Fig. 2, though I prefer the screw-rod and swivel illustrated for the reason that while simple they also permit the free rotation of the tongs. Such rotation is important in order that the tongs may be presented in proper position to grasp the ingot or other load however it may stand. It is effected through the medium of a gear-wheel *e*, made fast upon the frame B or its shank and meshing with a pinion *f*, carried by a rod or shaft *g*, which is mounted in suitable bearings on the bar or beam A and may be turned in any convenient manner. This feature constitutes no part of my invention in itself, but in order to provide for the vertical movement of the frame B the pinion *f* is made of greater thickness or measurement from face to face than is the gear-wheel E, in order that there may be a movement of one relatively to the other without unmeshing. The swivel comprises a cylindrical box or shell H, carried by the screw-rod I and of sufficient internal diameter to readily receive the disk or head *d* of rod G. Between the lower head or disk of shell H and the under face of the disk *d* are placed two circularly-channeled disks *h* and *i*, between which are placed steel balls or spheres. By this construction friction is greatly reduced between the two members of the swivel, and the screw-rod may be freely turned notwithstanding the load carried upon the rod G. This of course is important, since an extremely heavy load upon the rod would otherwise materially interfere with the free opening and closing of the jaws. The swivel also permits the rotation of the frame B whether the jaws are being opened or closed or are at rest.

In Fig. 3 I have represented the spring as resting upon a shoulder or abutment *k* at the lower end of rod G and as pressing upward against and within the tubular neck B' of frame B. The effect of this construction will be similar to that set forth in connection with Fig. 2, but the entire weight of the tongs is carried at all times upon the rod G. The manner of opening and closing the tongs will in this case be the same as under the construction shown in Fig. 2, and the final grap-

pling of the load will be due to a descent of the frame B and its attached parts when and to the extent that the load exceeds the sustaining power of the spring E.

5 In Figs. 4 and 5 I have represented the tongs as consisting of two jaw-levers having tapered openings through which is passed a supporting-rod *l*, suspended by hangers *m* from the sleeve or neck B'; or, in other words, I have represented a frame in which the hangers or depending portions are made separate from but are bolted or otherwise secured to the upper portion of the frame. The jaw-levers C, being in this case hung upon the common rod *l*, may be placed nearer together or farther apart by turning forward or backward the nuts upon said rod. When this is done, the links *c* should be made capable of elongation or shortening in order to preserve the proper relative positions or angular adjustments of the jaw-levers C C and the links *c c*. This may be accomplished by making the links with two or more pivot-holes at one end, as in Fig. 6, or by making said links in two parts with a series of bolt-holes, as in Fig. 7, the parts being lapped more or less, as required, and bolted together; or, finally, a right and left threaded nut or sleeve may be screwed upon the proximate ends of two threaded members to constitute a link, as in Fig. 8.

In Fig. 5 the hangers *m* are represented as of curved form, and if made of this or other bent form and of spring-steel or other elastic material of suitable strength they may be made to serve the function of the spring E. It will be seen upon referring to Fig. 5 that after the load is duly engaged by the tongs its weight will tend to straighten the arms or hangers *m* and thereby to lower the pivots of the jaws C and to throw the gripping ends of said jaws inward toward each other.

Under the construction shown in Fig. 3 a nut *n* or equivalent device will be applied to the upper end of the neck B' to prevent the neck from descending below a predetermined point.

In the construction shown in Fig. 4 either the collar D, spring E, and nut F (shown in Fig. 2) or the spring E and nut *n* (shown in Fig. 3) should be used, preferably the former.

In the construction shown in Fig. 5 the hangers *m m* being made the elastic members no longitudinal movement of shank or neck B' is necessary, and nut *n* is placed in contact with the end of bearing *a* in bar A.

Having thus described my invention, what I claim is—

1. In combination with grappling jaws or tongs and with a supporting-frame therefor, a rod connected with and serving to actuate the jaws, and an elastic member adapted to carry the weight of the tongs, substantially as set forth.

2. A grappling device provided with a pair of jaws or grappling-levers, a support for said levers, means for opening and closing the le-

vers relatively to each other, and an elastic member adapted to sustain the pivotal support of the jaws and to permit a descent of the jaws and an automatic grappling of the load when the tongs are lifted.

3. In combination with a main supporting bar or beam A, a frame B B' longitudinally movable relatively to the bar or beam A; tongs or grappling-levers pivoted in the frame B; a rod G connected with the grappling-levers, and a spring E serving to support the frame B and the grappling-levers, substantially as set forth.

4. In combination with a supporting bar or beam A, a frame B B' mounted therein; grappling-levers pivoted in said frame; a spring E serving to support the frame B; a rod G connected with and serving to actuate the grappling-jaws C; a screw-rod I passing through a fixed nut in the bar or beam A, and a swivel joint or connection between the rods G and I, substantially as and for the purpose set forth.

5. In combination with a bar or beam A and with tongs carried thereby, an actuating-rod connected with the tongs jaws or levers; a fixed nut carried by the bar or beam; a screw-stem passing through said nut, and a swivel connecting the screw-stem and the actuating-rod, substantially as and for the purpose set forth.

6. In combination with a bar or beam A, a frame B provided with a neck or shank B' adapted to be rotated and to move longitudinally relatively to the bar or beam A; a spring E serving to sustain the weight of frame B; grappling levers or tongs C carried by the frame B; actuating-rod G connected with said levers; fixed nut J carried by the bar or beam A; screw-stem I passing through said nut, and a swivel connecting the screw-stem and the rod G substantially as described.

7. In combination with the bar or beam A, swiveled frame B, grappling-levers C, and actuating-rod G connected with said levers; screw-stem I connected with the rod by a swivel; supporting-spring E interposed between the bar A and the frame B B'; gear-wheel *e* carried by frame B, and elongated pinion *f* meshing with said gear-wheel, substantially as and for the purpose set forth.

8. In combination with tongs or grappling devices, a rod connected with and serving to actuate the jaws thereof; a screw-stem for moving said rod longitudinally, and a swivel connecting the screw-stem and the rod and having antifriction-rollers interposed between its members substantially as described, whereby the screw-stem is adapted to be turned notwithstanding the load brought upon the rod.

9. In combination with a supporting-frame B, jaw-levers C pivoted therein, and links *c* connecting the jaw-levers, a screw-rod passing through a fixed nut, and having a swivel connection with the links, substantially as and for the purpose set forth.

10. In a grappling device, the combination
of a frame, automatic grappling-jaws carried
by said frame, an actuating-rod for impart-
ing an initial movement to the jaws, and ad-
5 justable connections between the rod and
jaws, substantially as and for the purpose set
forth.

11. In combination with grappling jaws or
tongs and with a supporting-frame therefor,
10 a rod connected with and serving to actuate

the jaws, an elastic member adapted to carry
the weight of the tongs, and adjustable fulcrum
for the jaws, substantially as described and
shown.

In witness whereof I hereunto set my hand 15
in the presence of two witnesses.

HARRY SAWYER.

Witnesses:

J. G. EMERY, Jr.,
F. W. BABCOCK.