No. 786,788. PATENTED APR. 4, 1905.

M. F. HUDSON.

WRENCH.

APPLICATION FILED JUNE 23, 1904.

2 SHEETS—SHEET 1.

Fig. 1

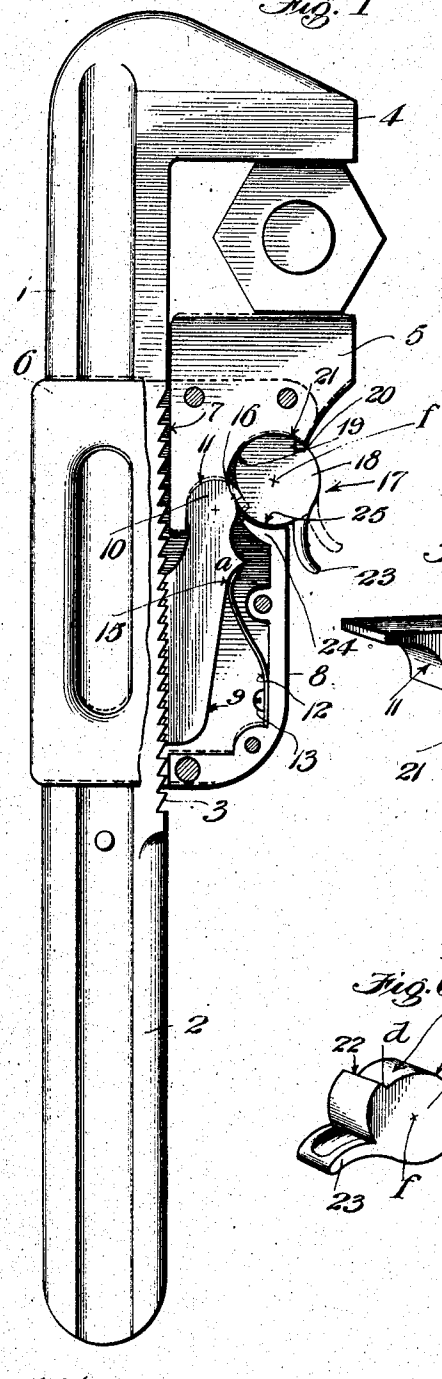


Fig. 3

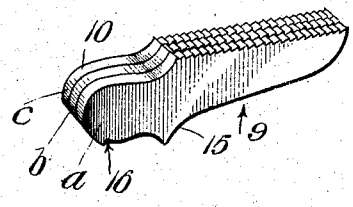


Fig. 4

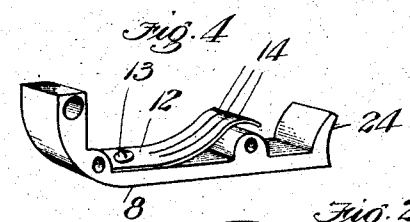


Fig. 5

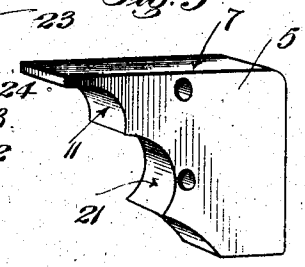


Fig. 2

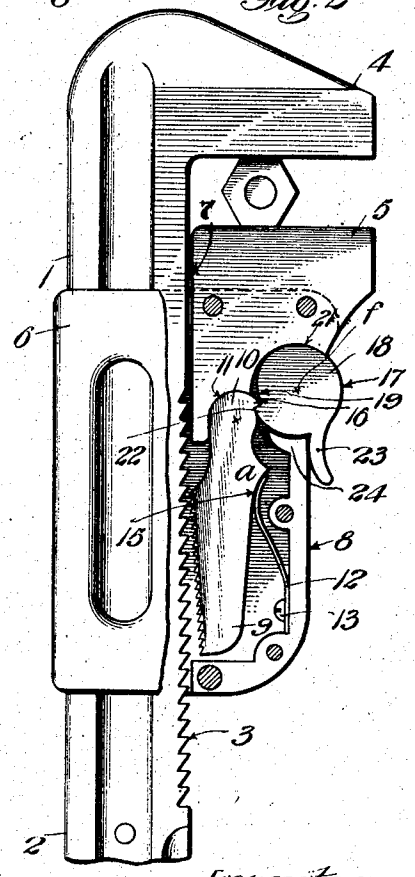
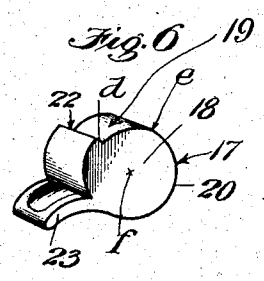


Fig. 6



Witnesses
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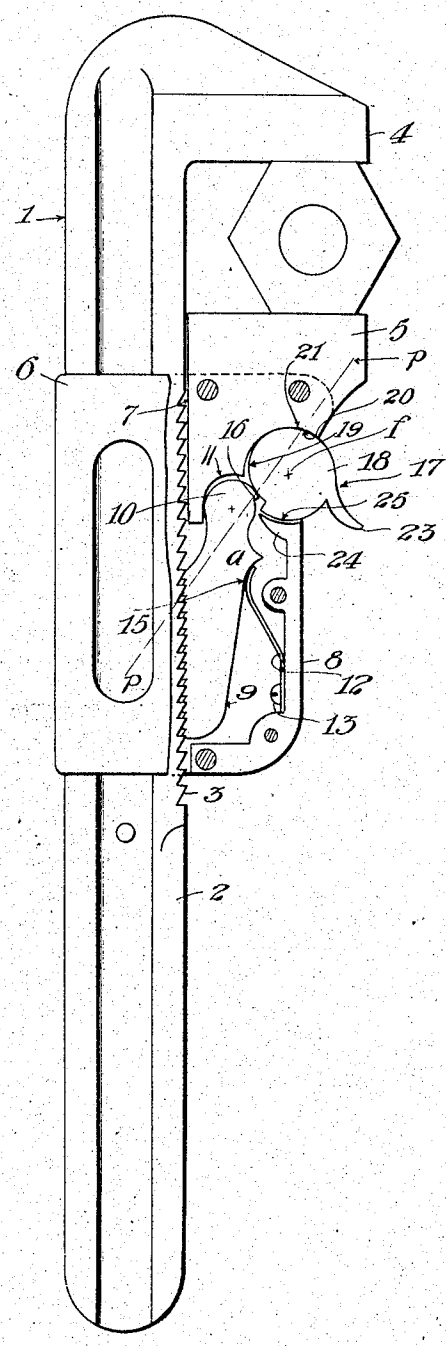
2 SHEETS—SHEET 2.

Fig. 7



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UNITED STATES PATENT OFFICE.

MILLARD F. HUDSON, OF LOS ANGELES, CALIFORNIA.

WRENCH.

SPECIFICATION forming part of Letters Patent No. 786,788, dated April 4, 1905.

Application filed June 23, 1904. Serial No. 213,807.

To all whom it may concern:

Be it known that I, MILLARD F. HUDSON, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Wrench, of which the following is a specification.

This invention relates to quick-acting monkey-wrenches of the type in which the shank of the wrench is provided with teeth and the movable jaw has one or more detents for engaging the teeth of the shank.

The main object of the present invention is to provide a novel and efficient means for controlling the detent or detents.

Further objects are to simplify the construction and increase the strength of the small parts, to do away with pivots, and provide solid abutments for sustaining the thrust of the small parts which occurs when the wrench is being used.

In a former patent of mine, No. 759,813, May 10, 1904, is shown a wrench having a toothed shank, and the movable jaw is supplied with a series of pivoted detents, each detent having a series of teeth, the detents being spring-pressed against the toothed shank and serially engaging the teeth of the shank, whereby relatively coarse teeth may be used on the shank and the movable jaw may be adjusted to a fine degree. It is obvious that while such a construction would for most purposes secure a sufficiently close adjustment of the movable jaw in many cases such adjustment would not be sufficient and a certain looseness would result between the jaws of the wrench and the nut and the consequent lost motion would allow the wrench to twist somewhat on the nut and round off the corners of the nut. Further, such lost motion reduces the effective working radius of the wrench, and it is particularly advantageous in such cases to have the closest possible fit of the jaws upon the nut, so that the entire swing of the wrench-handle in its working radius is utilized throughout its throw to turn the nut. This lost motion allows a certain free movement of the wrench before the nut is turned, and when considerable force is applied to the wrench to turn it the jaws take hold of the nut with a violence which is detrimental to the parts of the wrench as well as to the corners of the nut.

The present invention is applicable with one or more detents, the teeth of which may be of the same or any appropriate pitch relative to those of the toothed bar.

An object is to construct a wrench out of pieces that can be readily made by drop-forging and that can be easily and rapidly assembled.

This invention is applicable in clamping devices—as wrenches, vises, &c.—wherein one member has a movement along another and is held against back motion by a detent and is distinguished by having the detent which is free simply fulcrumed as a lever of the first class and normally yieldingly held in engagement with the rack-bar or toothed shank and also in a seat by a spring and movable out of such engagement and shiftable lengthwise of the movable member out of the seat, and in that a single piece, free from the detent, to be operated by the thumb of the user is constructed and arranged to be moved into three positions, in one of which a part thereof acts on one end of the detent as on a lever of the first class to disengage the other end of the lever or detent from the bar, in another position it acts on the detent to shift the movable member endwise, and in a third position leaves the detent free. The part which operates the detent is arranged as a cam to shift the detent from its seat while the detent is engaged with the bar, thus to shift the moving member along the bar. An object is to so construct and arrange the parts of the wrench that one using the same can tighten the jaw on a nut by a simple movement of the thumb that at once acts on the handle, tongue, or thumb-piece of the cam that moves the detent and also at the same time forces the moving jaw along the shank or bar toward the fixed jaw. By making and fulcruming the detent as a free shiftable lever of the first class it is made possible to bring the means for shifting the lever between the teeth of the detent and the face of the jaw to shove the teeth firmly home and the jaw forward at a motion of the thumb-piece in one direction and to release the de-

tent by a pressure of the thumb-piece in a direction away from the nut engaging the face of the jaw. A further advantage is gained by mounting the detent as a lever of the first class in that the arm of the lever by which the toothed portion of the detent is lifted from or forced into engagement with the rack may be brought to a position where it can be actuated in first one and then the other position by a very slight movement of the thumb-piece of the operating member formed as a cam, which is free from the detent. The detent is free in the sense that it is unattached to the cam or other operating device and is not mounted on any shaft or pivot or on any cam, but is shiftable from and to different seats, in one of which it is pivotally held to swing to and from the rack, but in the other of which it is held in a firm rack-engaging position.

In the present invention the device for controlling the detents is operated by the thumb, a trigger-cam being employed. Depression of the tongue of the trigger-cam releases the detents and allows the movable jaw to be adjusted along the shank. The detents drop into engagement with the teeth on the shank and hold the movable jaw from retracting. By raising the tongue of the trigger-cam with the thumb the movable jaw is advanced a relatively short distance toward the stationary jaw with a powerful movement which takes up the lost motion and causes the jaws to tightly grip the nut, and the detents are at the same time locked from accidental disengagement with the teeth of the shank. In using the wrench on certain sizes of nuts the jaws may be adjusted sufficiently close by merely pushing up the movable jaw against the nut, the teeth of the detents readily clicking over the teeth of the shank during this movement.

The accompanying drawings illustrate the invention, and, referring thereto, Figure 1 is a side elevation of the wrench with part of the jaw-sleeve broken away to show the detents and trigger-cam and other features within the jaw-sleeve. In this view the wrench is shown as applied to a nut and the movable jaw has been adjusted as close as may be attained alone by the serial arrangement of the detents. The dotted lines indicate the additional closing movement of the movable jaw secured by manipulation of the trigger-cam. Fig. 2 is a view similar to Fig. 1, the lower portion of the wrench-handle being broken away, and the detents are shown as having been tilted free from the toothed shank by the depression of the trigger-cam. Fig. 3 is a perspective view of the three detents forming the series in the present embodiment. Fig. 4 is a perspective view showing the front wall of the jaw-sleeve which carries the detent-springs. Fig. 5 is a perspective view of the movable jaw, which is shown as detached from the jaw-sleeve. Fig. 6 is a perspective of the trigger-cam. Fig. 7 is a view similar to Fig. 1, showing the additional closing movement of the jaw attained by rocking the trigger-cam and illustrates the line of pressure through the trigger-cam and detent.

1 designates the shank, one end of which has a handle 2, and an intermediate portion of which is provided with teeth 3, which are relatively coarse.

4 is the stationary jaw formed on the upper end of the shank 1.

5 is the movable jaw having a sleeve 6, through which the shank 1 passes. In the present embodiment the jaw 5 is shown as riveted to the sleeve 6; but it may be desirable to form the sleeve 6 and jaw 5 out of one piece of metal. Such construction would obviously be but a mechanical expedient. The jaw 5 is provided with a flat smooth face 7, which is adapted to ride over the inner edge of the shank and over the teeth 3 to guide the jaw. The back of the shank and handle is smooth, and when the same is allowed to rest on the inside back wall (not shown) of the sleeve it can be moved freely back and forth in the sleeve whenever the detent 9 is lifted from the teeth, as indicated in Fig. 2.

The front wall 8 of the jaw-sleeve 6 forms a box or housing. The wall 8 is shown in the present embodiment as a separate piece riveted to the sleeve 6; but it is obvious that it could also be formed with the sleeve as one piece of metal which would be a mere mechanical expedient.

A series of detents 9, in the present embodiment comprising three detents *a*, *b*, and *c*, are mounted within the box formed in the sleeve 6, and the detents are provided with rounded heads 10, which take into a concave seat 11, formed on the movable jaw 5, the seat 11 being concentric with an imaginary axis at the center of the heads 10. Each detent has teeth, which in the present form are one-half the pitch of the teeth on the shank—that is, there are twice as many teeth on a detent for a given length of space as there are teeth on the shank in the same length of space. Thus when a detent engages the teeth of the shank alternate teeth of the detent only engage with the teeth on the shank, as is clearly shown in Fig. 1. In the present embodiment the detents are also serially arranged, as shown in Fig. 3. Thus the teeth of the detent *b* are spaced one-third of a tooth-space beyond the edges of the teeth of the detent *a*, while the teeth of the detent *c* are spaced one-third of a tooth-space beyond the edges of the teeth of the detent *b*.

Detent-springs are formed, preferably, from a single piece of spring-steel 12, which may be fastened to the wall 8 by a single screw 13, the piece 12 being split to form three tongues 14, each of which presses against a detent, each detent having an abutment 15 with a concave face, against which the curved ends

of the tongues rest, and the spring of the tongues against the curved faces 15 normally serves to hold the rounded heads 10 of the detents close against their common seat 11. The detents are thus pivotally mounted, as it were, although no pivot is used, the bearing being formed between the seat 11 and the rounded heads 10. Each detent is movable independently of the others, and each detent is also resiliently pressed against the teeth of the shank by the spring-tongues 14. Each detent is provided with a shoulder 16, all of which are in perfect alinement when the edges of the teeth of all of the detents lie in a common plane, as indicated in Fig. 3. The detents are controlled by a trigger-cam 17, which comprises a revoluble block 18, having a volute face 19, extending between the points *d* and *e*, and at *e* the volute face merges with a face 20, which is concentric with an imaginary axis *f* at the center of the block 18. The concentric face 20 rests against a concave seat 21, formed on the movable jaw 5, and which is concentric with the imaginary axis *f*. The seats 11 and 21 are adjacent to each other and their walls intersect, so that the shouldered portion of each of the detents projects slightly beyond the point of intersection in position to be engaged by the cam when the latter is manipulated. The trigger-cam is also provided with a shoulder 22, which bears against the shoulders 16 on the detents. Projecting from the block 18 is a curved tongue 23 for operating the trigger-cam. In order to prevent displacement of the trigger-cam, an abutment 24, having a concave face, is formed on the wall 8, while the block 18 of the trigger-cam also has a face 25, which is concentric with the axis *f* and adapted to bear upon the curved abutment 24, although in the present embodiment I prefer to construct the trigger-cam so that it is slightly loose between its seats 21 and 24, as shown in Fig. 1.

The detents 9 are normally resiliently pressed against the teeth 3 on the shank, and one of the detents always has its teeth squarely against the teeth 3. Thus with the movable jaw in a given position, with one of the detents—for instance, with the detent *a*—in engagement with the teeth 3, by pushing the movable jaw 5 toward the stationary jaw 4 a distance equal to one-sixth the width of a tooth 3 the detent *b* will drop into engagement with the teeth of the shank, the detent *a* in the meanwhile having been slightly tilted upwardly, owing to the inclined faces of the detent-teeth riding up on the inclined faces of the teeth 3, and by pushing the movable jaw still farther one-sixth the width of a tooth 3 the detent *c* will drop into engagement with the teeth 3, the detents *a* and *b* in the meanwhile both having been slightly raised, owing to the inclined edges of their teeth riding up the inclined edges of the teeth 3. A still further movement of the same degree of the movable jaw will again bring the detent *a* into engagement with the teeth on the shank. Thus in moving the movable jaw toward the stationary jaw the detents engage the teeth on the shank in regular rotation—first *a*, then *b*, then *c*, then *a*, and so on. To fit the jaws over a nut or other object, the movable jaw is pushed up against the nut, and if when the movable jaw is in that position one of the detents is in close engagement with the shank-teeth the movable jaw will be held close against the nut; if not, the movable jaw will sag back a trifle, at least as soon as the wrench is manipulated. In such case the tongue 23 should be raised into the position indicated by dotted lines in Fig. 1, which will rotate the trigger-cam upon the imaginary axis *f*, and its volute face 19 will be brought against the rounded heads 10 of all of the detents. It will be seen that as the trigger-cam is rotated thus the volute face rolls upon that portion of the curved heads 10 which extend beyond the seat 11, and this action moves the movable jaw up toward the nut, sliding the sleeve 6 upon the shank 1, the detents remaining stationary with respect to the shank 1, the seat 11 being moved slightly beyond the curved heads 10, as indicated by dotted lines in Fig. 1. Very little pressure upon the tongue 23 in raising it will give a very powerful spreading action between the movable jaw and detents, and the movable jaw will thus be very strongly held against the nut, and at the same time it is obvious that the detents are locked by this spreading action of the trigger-cam. With the close fit thus secured the wrench may be freely used without danger of rounding the corners of the nut or otherwise marring it. In actual use the wrench is rarely held perfectly perpendicular to the nut when adjusting the jaw, so that, even though the jaw is pushed hard against the nut when being adjusted as the wrench is operated and at times does stand perpendicular to the nut, the pressure of the jaws on the nut relaxes, and thus there is no absolute pinch of the jaws on the nut, which would make it difficult to remove the wrench easily; but this "looseness," if it may be so termed, is imperceptible, being a neat sliding fit of the jaws on the nut. When it is desired to retract the movable jaw, the tongue 23 should be depressed, which will rotate the trigger-cam slightly upon the imaginary axis *f*, and the shoulder 22, bearing against the shoulders 16 of all of the detents, will rock the detents and tilt them upwardly into the position shown in Fig. 2. I prefer to so form the trigger-cam and the heads of the detents that the shoulder 22 and the shoulder 16 lie between them about in line with the imaginary axes of the detents and the trigger-cam. When the parts are in the position shown in Fig. 1, the heads of the detents are seated against a solid abutment—the seat 11 in the jaw 5—the slight looseness of the trigger-cam between its seats

21 and 24 relieving it from sustaining any pressure from the detents. Thus when turning the nut the strain comes solely on the jaws, detent, and toothed shank. When, however, the trigger-cam is operated to push up the movable jaw, the trigger-cam enters into the chain of parts which sustain the strain, and the support of the jaw 5 is transferred from the seat 11 to the seat 21. The seat 24 receives no strain, as the line of pressure is through the jaw 5, trigger-cam, detent, and coöperating teeth of the shank, the line of pressure being on the line *p p*, Fig. 7. As in either case the detents, or detents and trigger-cam, are under compression strain and the arrangement of the concave seats and formation of the detents and trigger-cam for coaction therewith dispenses with pin-pivots, great resisting power of the parts combined, as well as increased strength of the individual parts, is attained.

A decided advantage of the present construction is that in releasing the detents the tongue of the trigger-cam swings in an arc which lies toward the hand of the user, and this movement conforms to the natural movement of the thumb much better than when the thumb-piece swings the other way, as in the former patent referred to.

I do not limit the invention to the particular construction shown, as it is obvious that a single detent or any desired number of detents of any requisite form may be used in various constructions without departing from the spirit of the invention.

What I claim is—

1. A wrench comprising a toothed shank, a movable jaw on the shank, a plurality of detents fulcrumed as a lever of the first class and loosely mounted to rock upon the movable jaw and a single means free from the detents, acting on the arm thereof for tilting the detents and for moving the jaw relatively to the detents.

2. A wrench comprising a toothed shank, a movable jaw on the shank, a spring-pressed detent having a head adapted to rock upon the movable jaw, said detent being unattached to the jaw, resilient means for normally holding the detent against the jaw, and a trigger-cam free from the detent and carried by the movable jaw for tilting the detent when moved in one direction and for shifting the movable jaw when moved in the other direction.

3. A wrench comprising a toothed shank, a movable jaw on the shank, a detent fulcrumed as a lever of the first class and carried by the movable jaw and having a head provided with a shoulder, a solid trigger-cam free from the detent and carried by the movable jaw and unconnected with the detent but having a shoulder for engaging the shoulder on the detent, and a suitable spring for normally holding the detent against the toothed shank.

4. A wrench comprising a toothed shank, a movable jaw on the shank, a plurality of detents fulcrumed as levers of the first class and carried by the movable jaw but unattached thereto and having shoulders on one arm of said lever, a trigger-cam free from the detents and revolubly mounted on the movable jaw but unattached thereto and having a shoulder for engaging the respective shoulders of the detents, and means for resiliently holding the detents normally against the toothed shank.

5. A wrench comprising a toothed shank, a movable jaw on the shank having a seat for a detent, a detent normally abutting against the seat, means free from the detent which tilts the detent on its seat when moved in one direction and for moving the jaw and seat for the detent away from the detent when moved in the other direction.

6. A wrench comprising a toothed shank, a movable jaw on the shank having a pair of seats, a detent normally engaging the shank and bearing against one seat, and a revoluble device bearing against the other seat and provided with a volute for engaging with the detent.

7. In a wrench, a toothed shank, a jaw-sleeve on the shank, a jaw on the sleeve, a free shiftable detent fulcrumed as a lever of the first class and constructed and arranged for normally engaging the toothed shank and preventing relative movement between the shank and sleeve, and means free from the detent for disengaging the detent from the shank or for producing a relative movement between the sleeve and the detent while the detent is in engagement with the shank.

8. In a wrench, a toothed shank, a jaw-sleeve on the shank, a jaw on the sleeve, a plurality of detents fulcrumed as levers of the first class and having rounded heads and shoulders, the jaw having a concave seat for the heads, a trigger-cam free from the detents comprising a revoluble block having a shoulder and a segmental volute face, a tongue on said block, the jaw having a rounded seat against which said block abuts, the shoulder of the block adapted to engage the shoulders of the detents, and suitable springs for normally holding the detents against the shank and also for normally holding the ends of the detents in their seat.

9. A wrench comprising a toothed shank, a jaw-sleeve on the shank, a jaw on the jaw-sleeve, a detent for engaging the shank, and a block interposed between the jaw and the detent and provided with a volute face for engaging with the detent whereby the jaw-sleeve and jaw may be shifted relatively to the detent to secure the proper adjustment of the jaw relatively to the shank.

10. A wrench comprising a toothed shank, a jaw-sleeve on the shank, a jaw on the jaw-sleeve, a plurality of detents for engaging the shank, a block having a volute face between the detents and the jaw whereby the operation

of the block brings the volute face against the ends of the detents, and the jaw-sleeve and jaw are moved relatively to the detents to secure adjustment of the jaw relatively to the shank.

11. A toothed shank, a member moving along said shank, a shifting fulcrumed detent having a toothed portion engaging the teeth of the shank, and a head, and fulcrumed in said moving member, and having a shoulder forming an arm of a lever of the first class on that side of the head opposite the toothed shank, a spring to cause the toothed portion of the detent to engage the shank-teeth, and a handled member constructed and arranged in said moving member to enter three positions in one of which it engages one side of the shoulder to release the detent when the handle is moved into retracted position, to leave the detent free to click when the handle is in an intermediate position, and to engage the head at the other side of the shoulder to shift the detent rearwardly of the moving member when the handle is an advanced position.

12. A toothed shank, a moving member thereon having a chamber and an opening therefrom opposite the teeth of the shank, a shifting spring-pressed detent fulcrumed in the chamber, to engage the teeth of the shank, and a member mounted in the moving member and furnished with a handle extending through said opening, and with a portion to lift and release the detent when the handle is in one position, to leave it free to act as a click when the handle is in another position, and furnished with another portion to shift the detent rearwardly in the moving member when the handle is pushed forward, said detent being mounted between said handle member and the toothed shank.

13. A toothed bar, a moving member thereon having seats for a detent and for a cam, a spring arranged to yieldingly hold the detent in said seat and in engagement with the teeth of the bar, and a three-position cam in said cam-seat engaging the detent on the side thereof opposite the toothed bar, constructed and arranged to leave the detent free at one position, to lift it from the teeth in another position, and to shift it rearwardly in its seat in another position.

14. A wrench comprising a toothed shank, a movable jaw thereon provided with two seats, a headed detent in said jaw with its head in one of the seats, and a cam in the other seat provided with means for tilting the detent when rotated in one direction and for moving the jaw relatively to the detent when rotated in the other direction.

15. A wrench comprising a toothed shank, a movable jaw thereon provided with two adjacent seats with their walls intersecting, a shouldered detent in one of the seats with its shouldered portion projecting beyond the point of intersection, and a cam in the other seat provided with a shoulder engaging with and tilting the detent when rotated in one direction, and a volute for engaging with the shouldered portion of the detent and moving the jaw relatively to the detent when rotated in the other direction.

16. A wrench comprising a toothed shank, a movable jaw thereon provided with two adjacent seats, the walls of which intersect, a plurality of shouldered and toothed detents in one of the seats, each detent being provided with a rounded head and a shouldered portion which projects beyond the point of intersection, the teeth of the detents being arranged serially relatively to the teeth of the shank, and a cam in the other seat provided with a shoulder in position to engage with and tilt the detents when rotated in one direction, and with a volute portion for engaging with the shouldered portion of the detents and moving the head relatively to the detents when the cam is rotated in the other direction.

In testimony whereof I have hereunto set my hand, at Los Angeles, California, this 17th day of June, 1904.

MILLARD F. HUDSON.

Witnesses:

GEORGE T. HACKLEY,

JAMES R. TOWNSEND.