Apr. 24, 1923. 1,452,642

F. J. KEATING

COMBINATION PLIERS

Filed April 6, 1921 2 Sheets-Sheet 1

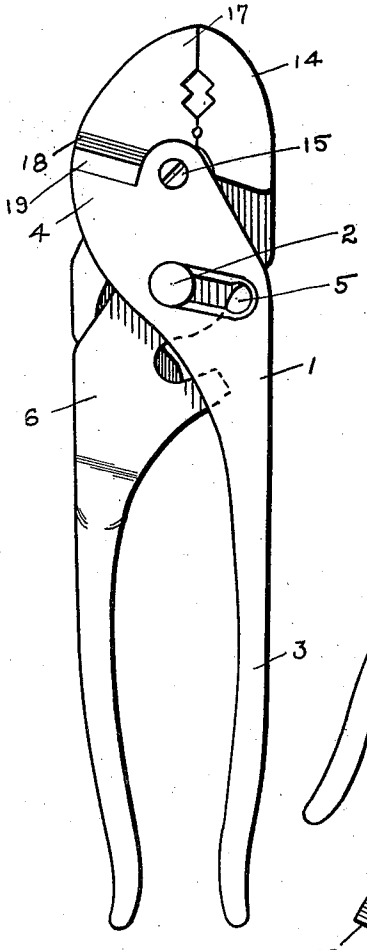



Fig. 1

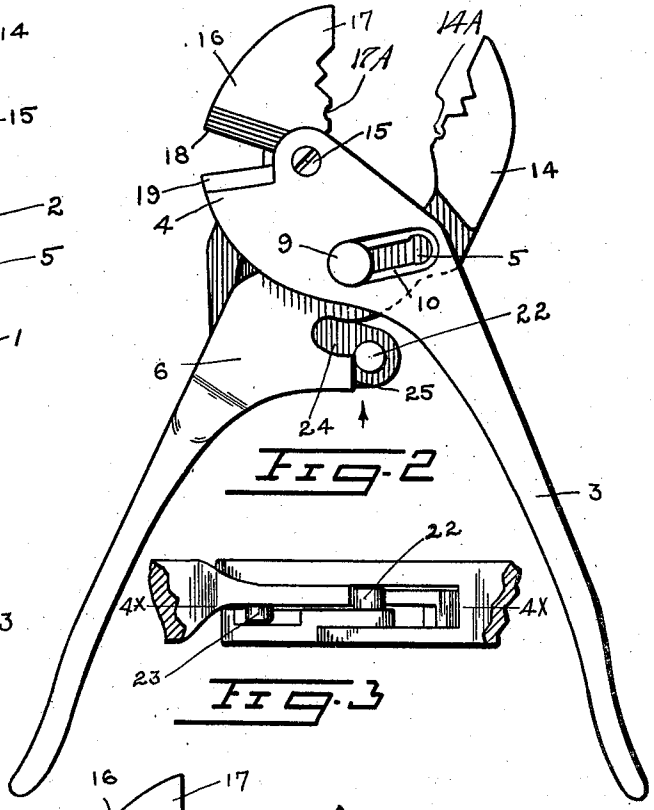



Fig. 2




Fig. 3

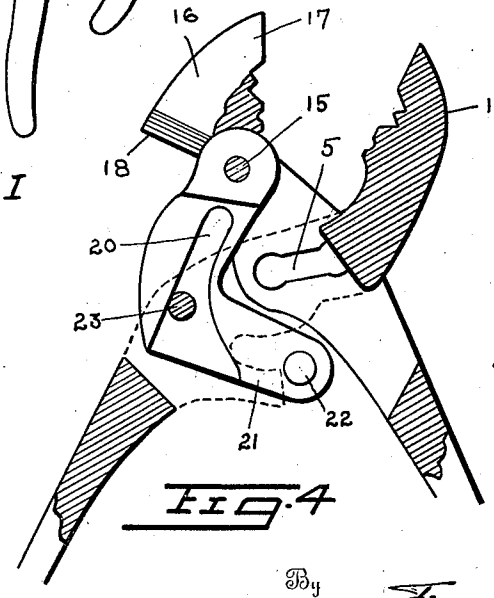



Fig. 4

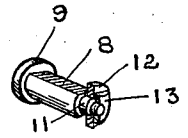



Fig. 9

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COMBINATION PLIERS

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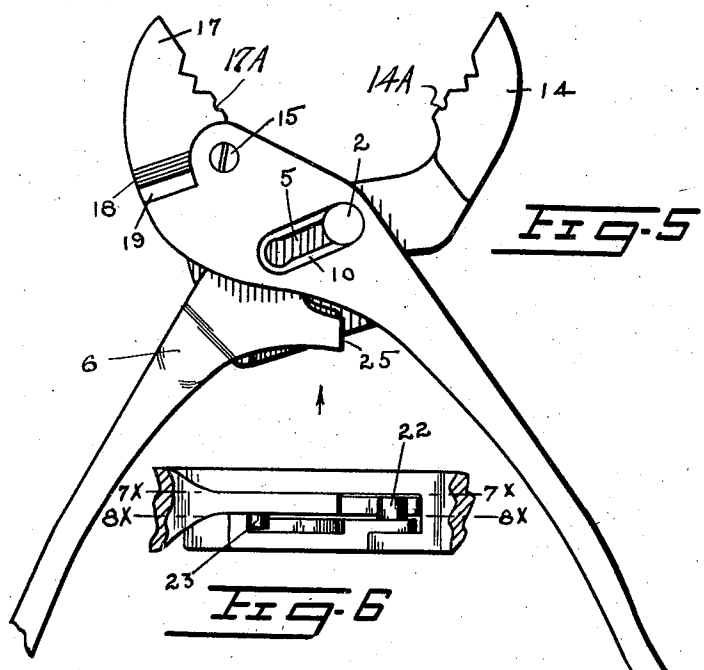



Fig-5

Fig-6

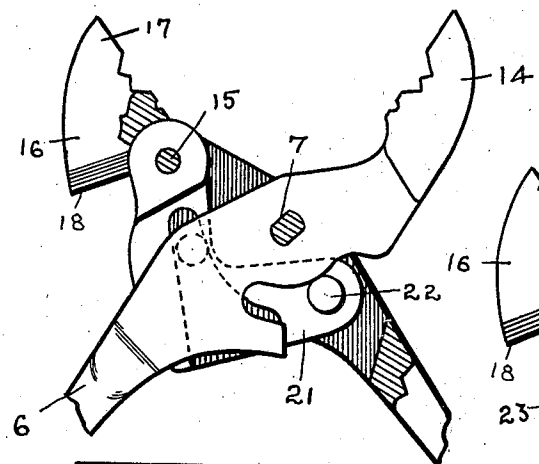



Fig-7

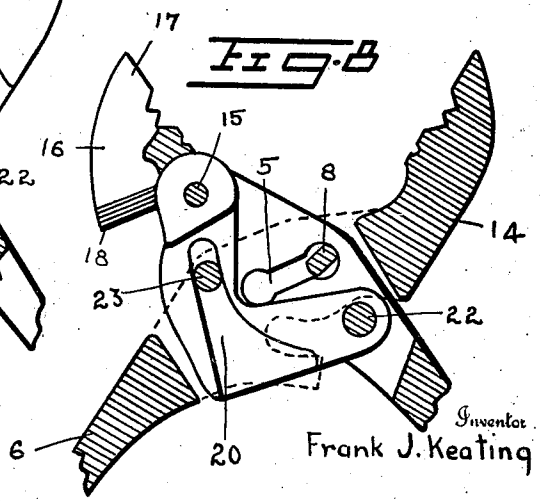



Fig-8

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# UNITED STATES PATENT OFFICE.

FRANK J. KEATING, OF ROCHESTER, NEW YORK.

## COMBINATION PLIERS.

Application filed April 6, 1921. Serial No. 459,145.

*To all whom it may concern:*

Be it known that I, FRANK J. KEATING, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Combination Pliers, of which the following is a specification.

The object of this invention is to provide new and improved pliers, in which the features of the variable fulcrum center or slip joint pliers are combined with those of a compound cutting lever pliers in order to make it more useful as a universal tool.

This and other objects of this invention will be fully illustrated in the drawing, described in the specification and pointed out in the claims at the end thereof.

In the accompanying drawing:

Figure 1 is a side elevation of the combination pliers in their closed position.

Fig. 2 is a side elevation of the pliers in their opened position, ready to be used as either a cutting or plying tool.

Fig. 3 is a bottom plan view of the pliers as illustrated in Fig. 2, viewing the pliers from below in the direction indicated by the arrow.

Fig. 4 is a sectional view of the pliers, the section being taken on the line $4^x$—$4^x$ of Fig. 3.

Fig. 5 is a side elevation of the pliers in their opened position when the jaws of the pliers have been moved apart to increase the capacity thereof.

Fig. 6 is a bottom plan view of the pliers in the position shown in Fig. 5, looking in the direction of the arrow.

Fig. 7 is a sectional view of the pliers, the section being taken on the line $7^x$—$7^x$ of Fig. 6.

Fig. 8 is a sectional view of the pliers, the section being taken on the line $8^x$—$8^x$ of Fig. 6.

Fig. 9 is a detail perspective view of the pivot stud of the combination pliers.

In the several figures of the drawing, like reference numerals indicate like parts.

The pliers, forming the subject matter of this invention, comprise a combination of the well-known type of pliers in which the fulcrum of the jaws can be shifted in order to increase or decrease the spanning capacity thereof and that of cutting pliers used for cutting wire, etc., in which compound leverage is applied to the cutting jaws. For this purpose, the pliers are made up of three levers that are fulcrumed with relation to one another in order to perform the function assigned to them.

The lever 1 is fulcrumed on the stud 2 with the handle 3 formed on one end thereof and the cutting jaw 4 formed at the other end thereof. The upper end of the lever 1, thru which the stud 2 is adapted to pass, is bifurcated and each of the sides of the bifurcation has a slot 5 provided therein. The stud 2 passes from the slot 5 on one side of the bifurcated end of the lever 1 thru the slot at the other side thereof and in doing so, spans the bifurcation. The lever 6 is mounted in the bifurcation of the lever 1 and the stud 2 passes thru the hole 7 provided therein. The stud 2, which is illustrated in detail in Fig. 9, is formed by a cylindrical shank 8 of which two diagonally opposite sides are flattened so as to engage the hole 7 without turning therein. In this way, the stud is held stationary in the lever 6. At one end of the stud 2 is formed the circular head 9, which projects into the slot 5 on one side of the bifurcated end of the lever 1. Each of the slots 5 is decreased in width at the inner side thereof by a suitable flange 10 and this flange is adapted to hold the head 9 in place on the slot 5 and prevent the stud from being disengaged therefrom. At the end of the stud opposite to that of the head 9, the stud is reduced in diameter to form a shoulder 11 thereon. A washer 12 is mounted on this shoulder in order to form a second head on the opposite end of the stud, which head is adapted to engage into the slot 5 in the other side of the bifurcated end of the lever 1. A flange similar to the one provided in the other slot 5 is provided to hold the head formed by the washer 12 in place in the slot. The washer, in turn, is held in place on the stud by means of the nut 13 threaded to the end of the stud 2. The head 9 and the washer 12 are provided for the purpose of forming large circular bearings for the levers to rock on. These bearings engage the rounded ends of the slot 5 in order to provide as large a bearing surface as possible therewith.

The flange 10 of each of the slots 5 is

widened out at each end for the flattened shank of the stud 2 to turn therein. This permits the bifurcated side of the lever 1 to rotate on the stud 2, which in turn is held stationary by its engagement with the lever 6. When it is desired to shift the stud from one end of the slot 5 to that of the other, the levers 1 and 6 are moved to hold the stud in a position in which the flattened sides thereof are placed in line with the sides of the flanges 10 of the slots 5 and thus permit the sliding of the stud from one end of the slot to the other end thereof. After the stud has been shifted, the levers 1 and 6 are again in a position in which they can be rocked with relation to each other because the slots are widened at each end to permit the turning of the shank of the stud 2. In shifting the stud 2 from one end of the slot to the other end thereof, the fulcrum around which the levers 1 and 6 are rocked, is moved so as to increase or decrease the spanning capacity of the jaws provided on the upper end of each of the levers 1 and 6. Thus, when the stud is located in the left-hand end of the slot, the pliers can be opened to the position shown in Fig. 2, and when the stud is moved to the right-hand end of the slot, the pliers can be opened to the position shown in Fig. 5.

On the upper end of the lever 6 is formed the clamping jaw 14, on the inner side of which are provided suitable teeth for the purpose of engaging the stock to be held therewith. In addition to the teeth, the jaws are also provided with a pin-pulling attachment which consists of a tapered groove $17^A$ and $14^A$ formed below and parallel to the set of teeth on each of the jaws. The upper end of the lever 1 has a second stud 15 provided therein which spans the outer end of the bifurcated end thereof. The short lever 16 is mounted to rock on this second stud in the bifurcated end of the lever. This lever 16 has the jaw 17 formed at the upper end thereof, which jaw forms the complement to the jaw 14 of the lever 6. Near the middle of the lever 16 is formed the cutting jaw 18. This cutting jaw is located opposite the cutting jaw 19 formed on the upper end of one of the sides of the bifurcated end of the lever 1.

The lower end of the lever 16 has a cam groove 20 cut into one side thereof. It is also provided with an angular extension 21 which carries near the outer end thereof the pin 22. A pin 23 carried on one side of the lever 6 is adapted to engage into the cam groove 20, in which it is adapted to move as will hereinafter be described. The lever 6 is also provided with a segmental groove 24, of which one side is partially cut away to form the shoulder 25 at the outer end thereof. This shoulder 25 is adapted to make contact with the pin 22 when the levers are disposed as shown in Figs. 1 to 4, inclusive; that is, when the jaws 14 and 17 are moved around the fulcrum in the left-hand end of the slots 5.

On the movement of the levers 1 and 6, the jaw 14, which forms a part of the lever 6, swings thru a predetermined arc either toward or away from the jaw 17 of the lever 16. The jaw 17, in turn, is operated by the levers 1 and 6. The lever 1 moves the jaw in one direction as it swings with the outer end thereof, to which it is pivoted, and the lever 6 operates to rock the jaw 17 by reason of the engagement of the lever 16 with the pin 23 provided on the lever 6. The latter movement is in the opposite direction from that given to the jaw by the lever 1, but is made thru a much smaller arc on account of the shorter radius that the lever has in swinging on the stud 15. The arc thru which the lever 16 is moved in swinging around the pivot 15 is also concentric to the arc thru which this same lever is moved by the lever 1 and this fact, together with the fact that the movement is a much shorter one than that of the jaw 14, brings the two jaws together at a predetermined position.

The movement of the cutting jaws 18 and 19, carried on the levers 16 and 1, respectively, is in unison with the movement of the jaws 14 and 17 and both pairs of jaws are brought together at the same time, the movement of the cutting jaw 18 being opposite to that of the cutting jaw 19 because of the independent movement of the lever 16 pivoted on the end of the lever 1.

When closing the jaws of the pliers, the shoulder 25 provided on the lever 6, moves the pin 22 and in turn the lower end of the lever 16 with it and in so doing rocks the lever to the right at the lower end and to the left at the upper end, while the upper end of the lever 6 itself moves to the left. The lever 1, which is moved at the same time, in turn moves its upper end to the right and with it the independently moving lever 16. This movement of the levers as above described, takes place when the pliers are to be closed in order to perform either a cutting or a plying operation and moves the levers from the position shown in Fig. 2 to that shown in Fig. 1.

As pointed out above, the engagement of the shoulder 25 with the pin 22 when the lower end of the lever 6 is moved to the right operates to engage the jaws 17 and 18 with the jaws 14 and 19, respectively. The movement of the jaws 17 and 18 away from the jaws 14 and 19, respectively, is effected by the engagement of the pin 23 carried by the lever 6 into the cam groove 20 of the lever 16. When the pliers are opened an amount sufficient to move them from the

position shown in Fig. 1 to that shown in Fig. 2, the pin 23 makes contact with the straight side of the cam groove 20 and in consequence thereof moves the lower end of the lever 16 with it. In this way, the engagement of the pin 23 with the cam groove moves the lever 16 in one direction and the engagement of the pin 22 with the shoulder 25 moves the lever in the opposite direction, no obstruction being provided for either pin when the levers are being moved in the direction in which the pins are not used to operate on the lever 16.

The cam groove 20 has a segmental edge formed opposite to the straight edge thereof and when the pivot stud 2 is shifted from one end of the slot to the other end thereof, the lever 16 is rocked by this movement and in doing so, brings the pin 23 against the curved edge of the cam groove 20. At the same time the pin 22, carried on the outer end of the lever 16, is shifted so that it moves in line with the curved slot 24 on the outside thereof. The position of the pins 22 and 23 when the fulcrum of the pliers is shifted, is such that on the movement of the levers 1 and 6, neither the shoulder 25 nor the straight edge of the cam engages the pins 22 and 23, respectively, because the position of the lower end of the lever 16 has been raised so that these pins are adapted to move over the curved path of the cam groove 20 and the radial slot 24.

This is made possible because the slot 5 is slightly angular to the horizontal and in shifting the fulcrum of the levers, the fulcrum is slightly raised and this, in turn, raises the lower end of the lever 16 with the result above pointed out.

When the jaws are in the extended position illustrated in Figs. 5 to 8, inclusive, the lever 16 does not move independently of the levers 1 and 6 because the pins 22 and 23 are moved out of engagement with the parts of the levers 6 and 16 that operate to move this lever on the movement of the lever 6. The relative position of the levers 16 and 6 is shown in Fig. 8 and it is apparent from an inspection of this figure that no obstruction to the movement of the pins 22 and 23 is formed by either the lever 16 or the lever 6.

I claim:

1. In combination pliers, the combination of a pair of levers, a cutting jaw formed on the outer end of one of said levers, a clamping jaw formed on the outer end of the other of said levers, a third lever pivoted on the end of one of said levers adjacent to the cutting jaw formed thereon, a cutting jaw and a clamping jaw formed on said third lever and co-operating with said jaws on said pair of levers, and means to keep said third lever active or inactive on the operation of said pair of levers.

2. In combination pliers, the combination of a pair of levers, one of said levers being bifurcated, a stud forming the fulcrum for said pair of levers, spanning the bifurcation of said lever, the other of said levers being mounted on said stud in the bifurcation of the other of said levers, said bifurcated end of said lever being slotted at each side to receive the heads of said stud and permit the shifting of said stud therein, the direction of the slots in the bifurcated end of said lever being angular to raise or lower the fulcrum of one of said levers with relation to the fulcrum of the other of said levers.

3. In combination pliers, the combination of a pair of levers, a third lever mounted to rock on one of said pair of levers, a cam formed on said third lever, a pin carried on said third lever, means on one of said pair of levers to engage said cam and rock said third lever in one direction, and means on said same lever to engage said pin and move said third lever in the other direction.

4. In combination pliers, the combination of a pair of levers, one of said levers being bifurcated at the end, the other of said levers being mounted in the bifurcation of said first lever, a third lever mounted to rock in the bifurcated end of said lever adjacent to the said second lever, a cam in said third lever, and a pin mounted on said second lever, said pin adapted to engage into said cam and move said third lever in one direction on the movement of said second lever in the same direction but keep said lever inoperative when moving in the other direction.

5. In combination pliers, the combination of a pair of levers, one of said levers being bifurcated at the end, the other of said levers being mounted in the bifurcation of said first lever, a third lever mounted to rock in the bifurcated end of said lever adjacent to said second lever, a cam in said third lever, a pin mounted on said second lever, said pin adapted to engage into said cam and move said third lever in one direction on the movement of said second lever in the same direction but keep said lever inoperative when moving in the other direction, a pin carried on the end of said third lever, and a shoulder on said second lever adapted to engage said pin, said shoulder being adapted to move said pin and rock said lever when moving in one direction but move ahead of said pin when moved by said second lever in the other direction.

6. In combination pliers, the combination of a pair of levers, the first of said levers having one end thereof bifurcated, said bifurcated end being slotted at each side thereof, said second lever mounted in the bifurcation of said first lever, a pivot pin carried on said second lever, and a circular head provided at each end of said pivot pin, said circular heads engaging the slots

at each side of the bifurcation of said first lever and forming bearings for the first lever to rock thereon.

7. In combination pliers, the combination of a pair of levers, the first of said levers having one end thereof bifurcated, said bifurcated end being slotted at each side thereof, said second lever mounted in the bifurcation of said first lever, a pivot pin carried on said second lever, a circular head provided at each end of said pivot pin, said circular heads engaging the slots at each side of the bifurcation of said first lever and forming bearings for the first lever to rock thereon, a third lever mounted to rock on the end of said first lever between the bifurcation thereof, said third lever having an angular extension on one side thereof, a pin carried on said extension, means on said second lever to engage said pin when moving in one direction, a cam on said third lever, and means on said second lever to engage said cam and move said third lever in the other direction.

8. In combination pliers, the combination of a pair of levers, a pivot pin carried by one of said levers, said second lever being adapted to rock on said pivot pin, said second lever having a slot adapted to receive said pivot pin, said pivot pin being adapted to slide in the slot in said second lever and shift the fulcrum of said levers formed by said pivot pin, a third lever mounted to rock on the end of said second lever, and means engaging said third lever when said stud is at one end of the slot in said second lever, said means being moved out of engagement with said second lever when said stud is shifted to the other end of said second lever.

9. In combination pliers, the combination of a pair of levers, one of said levers being bifurcated at the end, the other of said levers being mounted in the bifurcation of said first lever, a third lever mounted to rock on the end of said first lever adjacent to said second lever, and means to lock said third lever rigidly to said first lever and form a single lever unit therewith.

10. In combination pliers, the combination of three levers, a pair of fulcrum studs, one of said fulcrum studs being adapted to be shifted to change the fulcrum of two of said levers and move the second fulcrum stud with relation to one of said levers.

11. In combination pliers, the combination of a pair of levers, a fulcrum pin anchored in one of said levers, the other of said levers being fulcrumed on said fulcrum pin, a third lever pivoted on said second lever, a sliding connection between said pair of levers, and means to operatively connect said third lever with said pair of levers when at one end of their sliding connection and leave said third lever inoperative when said pair of levers are at the other end of their sliding connection.

In testimony whereof I affix my signature.

FRANK J. KEATING.