May 12, 1931. F. ELWOOD 1,804,756

SHOVEL TOOTH

Filed Aug. 30, 1929 2 Sheets-Sheet 1

Fig. 1.

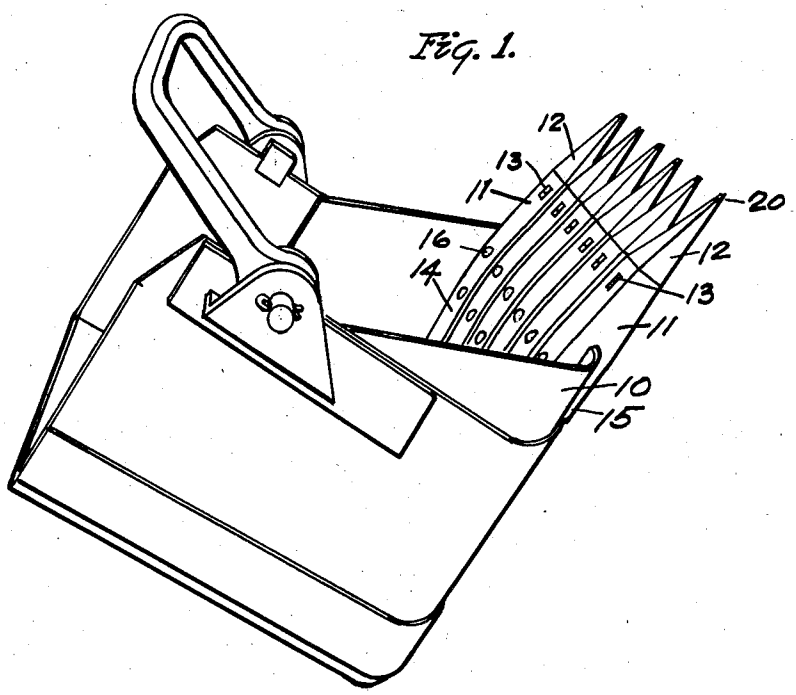


Fig. 2

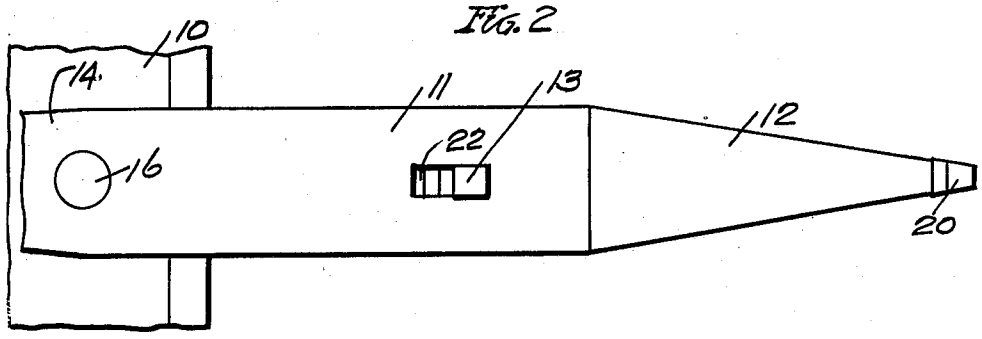
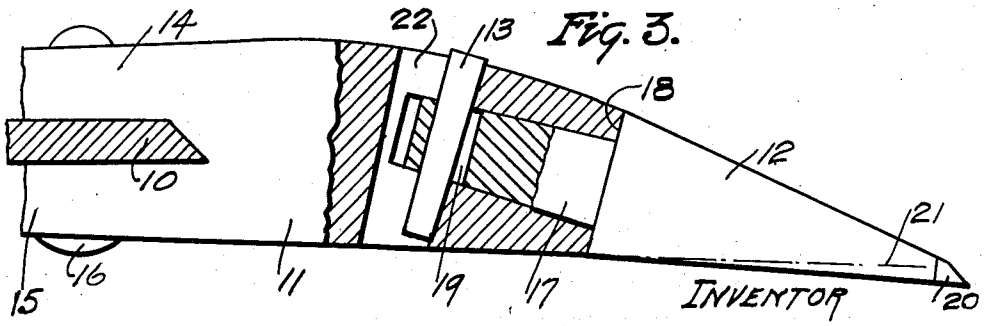


Fig. 3.



INVENTOR

FRANK ELWOOD

By J. H. Weatherford

ATTORNEY.

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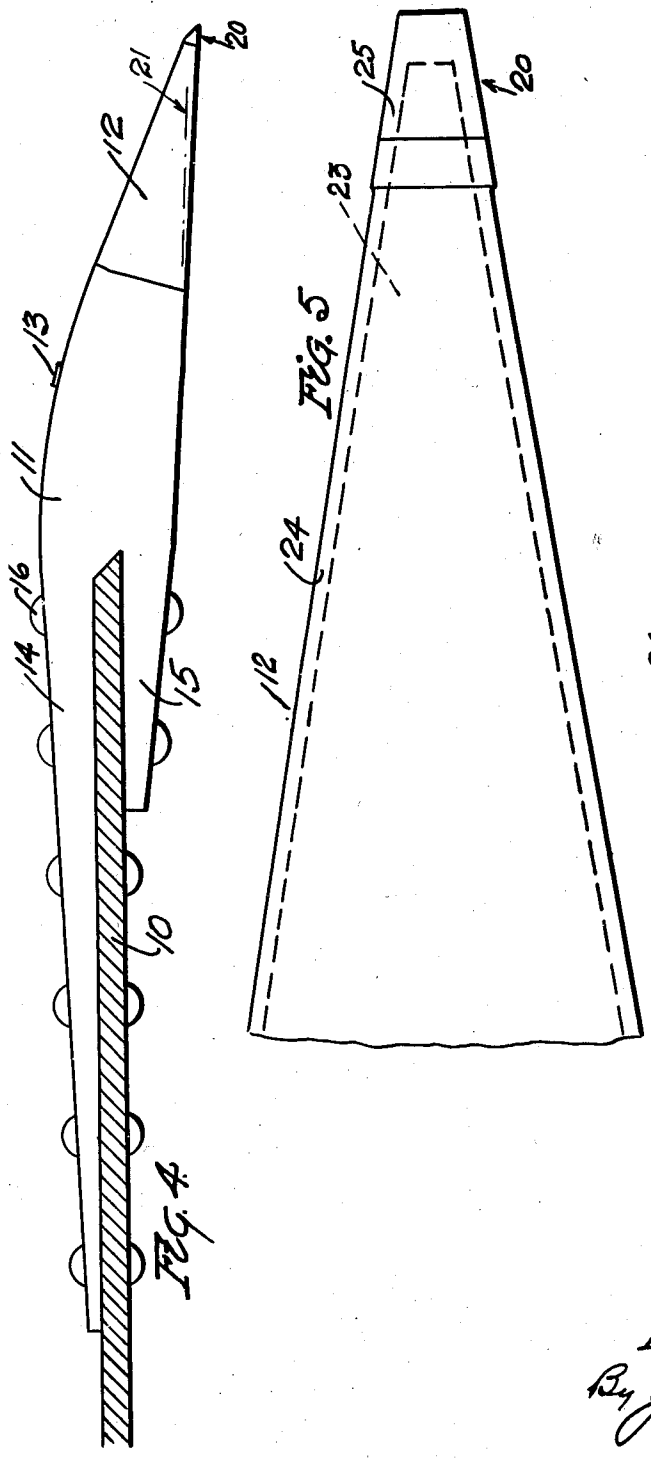


Fig. 4

Fig. 5

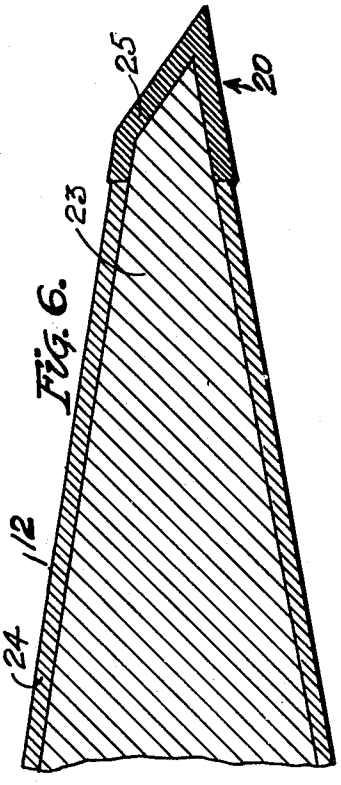


Fig. 6.

INVENTOR

FRANK ELWOOD

By J. H. Weatherford

ATTORNEY.

Patented May 12, 1931 1,804,756

UNITED STATES PATENT OFFICE

FRANK ELWOOD, OF CARBONDALE, ILLINOIS, ASSIGNOR OF ONE-HALF TO FRANK A. THOMPSON, OF CARBONDALE, ILLINOIS

SHOVEL TOOTH

Application filed August 30, 1929. Serial No. 389,414.

This invention relates to improvements in teeth for shovels or dippers such as are used on power operated excavating machines. It has especial reference to teeth adapted for use with hard materials such as coal, shale or other laminated or comparatively soft rock which it is possible to handle without shooting, yet, which dulls or wears out the points of the teeth with such rapidity as to cause serious delays in the operation of the machines. In operating such machines with even extremely hard teeth the delays due to replacements and the consequent tying up of all the operations depending on the shovel often amount to more than the remaining working time.

The objects of this invention are:—

(*a*) To make a tooth with a removable point which may be easily and quickly changed, yet which is so connected as to develop maximum strength and bearing between the tooth and point;

(*b*) To provide means for securing such a point rigidly in place;

(*c*) To provide easy means whereby the point may be removed from the tooth proper;

(*d*) To provide an efficient shape for the cutting edge of the point;

(*e*) To provide a maximum of strength and toughness in combination with an extreme of hardness for the cutting edge of the point;

(*f*) To increase the hardness while retaining the toughness and strength of the remainder of the point; and

(*g*) To provide an efficient form of tooth and point.

The means by which the foregoing and other objects are accomplished, and the manner of their accomplishment will readily be understood from the following specification on reference to the accompanying drawings in which:—

Fig. 1, is a perspective view of a shovel equipped with six teeth of my improved construction.

Fig. 2, is a plan view of the forward end and point of a tooth, this view showing a fragmentary portion of the shovel shell to which the tooth is attached.

Fig. 3, is a side elevation of the same portion of the tooth and point showing a portion of the point socket in section.

Fig. 4, is a slightly reduced scale side view of a complete tooth and point attached to a portion of the shell.

Fig. 5, is an enlarged plan view of a portion of a point of the tooth; and

Fig. 6, is a similar vertical section of the same portion of the point.

Referring now to the drawings in which the various parts are indicated by numerals, 10 is the shovel shell. 11 is the body portion of the teeth, 12 the teeth points and 13 keys for securing the points to the bodies of the teeth. 14 are the usual upper shanks of the teeth which extend rearwardly inside of the shovel shell and 15 the outer shanks which extend rearwardly outside of the shell. 16 are rivets securing the shanks to the shell.

The tooth point 12 is provided with a rearwardly extending shank 17, preferably square in cross section and slightly tapered rearwardly. This shank is symmetrically disposed about the axial center line of the point and is of reduced cross section so that a shoulder 18 is formed entirely therearound at its junction with the tooth body. The shank 17 is provided with a slot 19 adjacent the rear end thereof, which slot conforms in width to the thickness of the key 13 but is somewhat longer than the width thereof.

The bottom of the tooth body is substantially flat and straight, while the upper surface curves over and downward toward the front, to effect a structure converging to conform in shape and size to the point to be used therewith. A socket is formed in the end of the body portion conforming in size and shape to the tapered shank 17, this socket extends rearwardly and upwardly from the front end of the tooth body 19 at such angle as to give the proper pitch to the point 12, this pitch being such as to bring the tip 20 of the point of the tooth somewhat below the plane 21 of the under surface of the tooth body. The end of the tooth body is faced exactly at right angles to the axial center line of the socket therein and at an angle to the body, forming

a shoulder against which the shoulder 18 of the point may abut.

A slot 22 is formed in the tooth body, the width of which slot is the same as the thickness of the key 13. The key 13 has a slight taper and the forward edge of the slot 22 is similarly inclined so that the key, when driven in to secure the shank 17 in place, wedges the same tightly into the socket provided therefor. The rear of the slot 22 is extended beyond the rear end of the shank, when the same is in place, so that a tool may be inserted therein for driving out the point when this becomes necessary. Preferably the rear of this socket is slightly inclined to the end of the shank 17 so that a wedge shaped tool may be used for such purpose.

It will be noted that the key 13 does not extend below the bottom of the tooth body and although shown slightly above the top thereof it is preferably driven substantially flush therewith. Should these conditions not be obtained, due to wear or otherwise, the key is removed and a slightly wider key is inserted, or shims are put in, to accomplish the same result.

The tip 20 of the tooth is made chisel shaped and is quite narrow in plan, so that the tooth point tapers sharply both in plan and elevation. The bottom of the tip is substantially parallel with the under surface of the point 12, and the top thereof is beveled sharply downward to meet the under surface in a horizontally disposed knife edge, thus forming a chisel shaped point, it being essential that the cutting edge lie in the bottom surface of the point.

A chisel shaped point of this kind is adapted to take advantage of any existing stratification, but in addition the narrowing of the tip and the essentially horizontal disposition of the under surface accomplishes a substantial reduction in the power necessary to accomplish initial entry of the tooth into the material to be dug and in the pull on the bucket bail. These factors make use of a larger bucket possible. It will be noted that such a tooth point is secured by making a tapered point, substantially square in cross section, and beveling the tip thereof downward at about 45 degrees to an intersection with the bottom surface of the tip.

The body of the tooth is made of a hard and tough steel, preferably such as chrome steel. The point has a core 23 of similar material which is preferably plated along its entire length except the extreme tip, with a substantial thickness 24 of an extremely hard metal such as molybdenum steel. The tip of the point is provided with a superhard casing or plating 25, of substantial thickness, the material used therefor preferably being a material such as "Stellite" or in extreme cases where the importance of the operation will justify it, of "Carboloy." The relative size of core and thickness of plating ordinarily used are shown by the Figs. 5 and 6 of the drawing. The molybdenum steel plating 24 is ordinarily formed by welding a plate of molybdenum steel directly on the core, and the "Stellite" tip or "Carboloy" tip is sweated thereon or otherwise secured thereto in the manner in which such materials must be handled.

Preferably the rear termination of this super-hard tip is slightly larger than the immediately adjoining portion of the point, this ordinarily being accomplished by making a core of uniform taper and plating the tip of it with a slightly thicker plating than that portion of the point extending rearward therefrom. In sharpening the point the edge of the chisel is kept substantially along the bottom surface of the tip until the plating surface is worn through, after which the tooth point must be replated.

In making use of this tooth, I provide two sets of points for each set of teeth. As the points become dull under use the keys are knocked out, the points driven out and a new set inserted and keyed in. The shovel dipper may then be immediately put in use and the points removed be sharpened ready for reinsertion when the set which was substituted for them becomes dull.

I have found in mining coal with the points of extreme hardness using "Stellite" that I am able to operate an entire eight hour shift as compared with less than two hours with the best material which I formerly could get.

Having described my invention, what I claim is:

1. A shovel tooth comprising a body portion having rearwardly extending shanks to provide for attachment to the shell of the shovel, the under surface of said body portion being substantially straight and the upper portion thereof curving over and downward toward said lower surface, a detachable point substantially rectangular in cross section and tapering forwardly, said point having a chisel shaped tip thereon, the edge of said tip being flush with the bottom surface of said point, said point having a tapered shank of reduced cross section extending rearwardly therefrom and symmetrically located around the longitudinal axis of said point whereby a shoulder is formed at the junction of the shank and point, the body portion of said tooth having a socket complementary to said shank, formed therein and extending rearwardly and upwardly from the forward end of said body portion at such angle as to depress the edge of said tip below the plane of the bottom surface of said body portion when said shank is disposed in said socket, the forward end of the body portion being faced at right angles to the axial center line of said socket whereby

the shoulder on said point will seat firmly thereagainst when said shank is disposed and seated in said socket, said shank and said body portion having complementary keyways formed therein and a key disposable in said keyways for securing said point to said body portion.

2. A shovel tooth comprising a body portion having rearwardly extending shanks to provide for attachment to the shell of the shovel, the under surface of said body portion being substantially straight and the upper portion thereof curving over and downward toward said lower surface, a detachable point substantially rectangular in cross section and tapering forwardly, said point having a chisel shaped tip thereon, the edge of said tip being flush with the bottom surface of said point, said point having a tapered shank of reduced cross section extending rearwardly therefrom and symmetrically located around the longitudinal axis of said point whereby a shoulder is formed at the junction of the shank and point, the body portion of said tooth having a socket complementary to said shank, formed therein and extending rearwardly and upwardly from the forward end of said body portion at such angle as to depress the edge of said tip below the plane of the bottom surface of said body portion when said shank is disposed in said socket, the forward end of the body portion being faced at right angles to the axial center line of said socket whereby the shoulder on said point will seat firmly thereagainst when said shank is disposed and seated in said socket, said shank and said body portion having complementary keyways formed therein, the keyway in said body portion extending rearwardly beyond the extreme end of said shank and a key disposable in said keyway for securing said point to said body portion.

3. A shovel tooth comprising a body portion having rearwardly extending shanks to provide for attachment to the shell of the shovel, the under surface of said body portion being substantially straight and the upper portion thereof curving over and downward toward said lower surface, a detachable point substantially rectangular in cross section and tapering forwardly, said point having a tapered shank of reduced cross section extending rearwardly therefrom and symmetrically located around the longitudinal axis of said point whereby a shoulder is formed at the junction of the shank and point; the body portion of said tooth having a socket, complementary to said shank, formed therein and extending rearwardly and upwardly from the forward end of said body portion at such angle as to depress the forward end of said point, below the plane of the bottom surface of said body portion when said shank is disposed in said socket, the forward end of the body portion being faced at right angles to the axial center line of said socket whereby the shoulder on said point will seat firmly thereagainst when said shank is disposed and seated in said socket, said shank and said body portion having complementary keyways formed therein, and a key disposable in said keyways for securing said point to said body portion.

4. A point for a shovel tooth including a central core of hard and tough steel, a chisel shaped tip of extremely hard material surrounding the forward end of said core and a plating of hardened steel extending rearwardly from said tip and encasing the remainder of said core.

5. A point for a shovel tooth including a central core of hard and tough steel, a layer of extremely hard material surrounding the tip of said core and a layer of hardened steel extending rearwardly from said tip and encasing said core.

In testimony whereof I hereunto affix my signature.

FRANK ELWOOD.