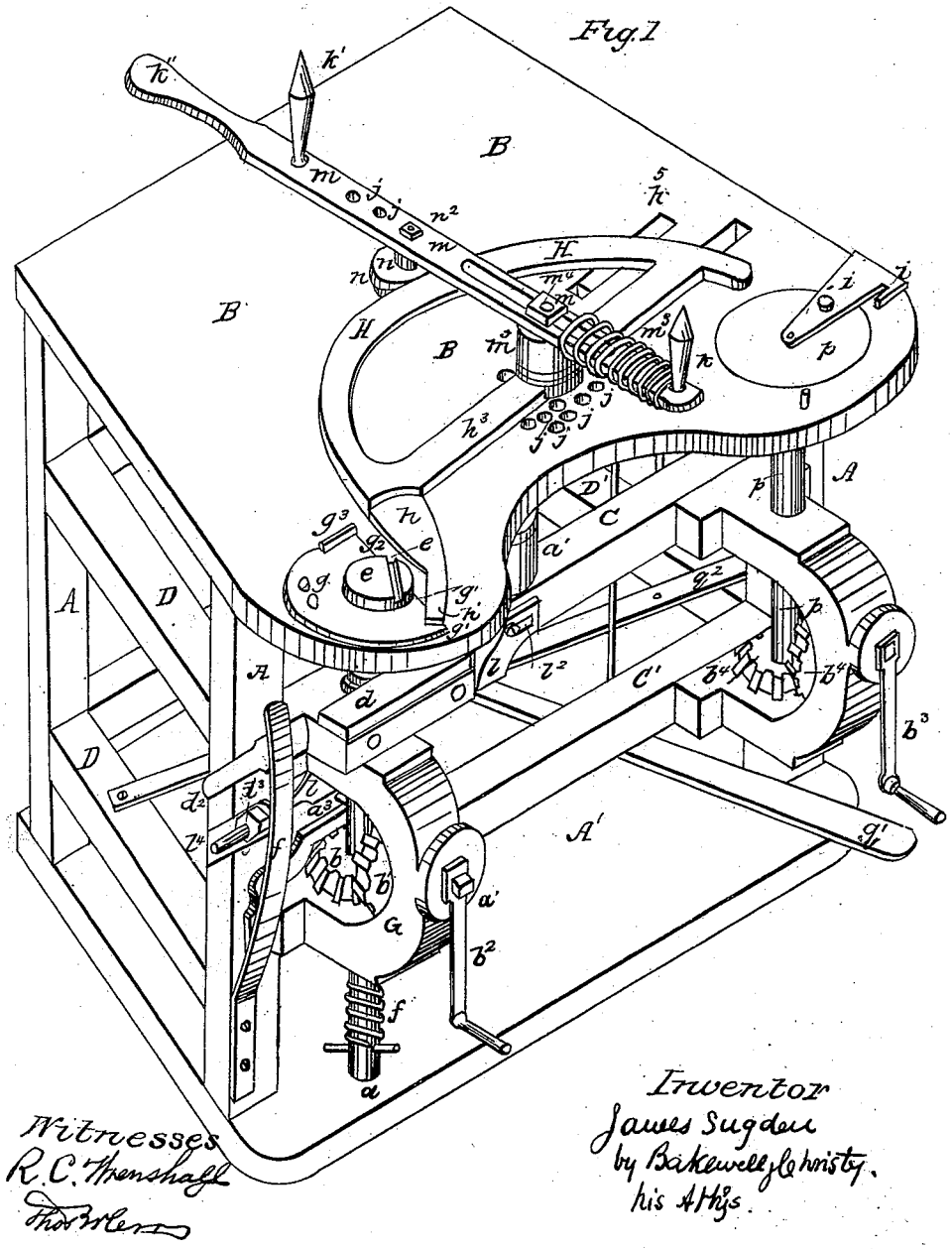
3 Sheets—Sheet 1.

J. SUGDEN.

Machine for Bending Rake Teeth.

No. 107,305. Patented Sept. 13, 1870.

Fig. 1



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3 Sheets—Sheet 2.

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Machine for Bending Rake Teeth.

No. 107,305. Patented Sept. 13, 1870.

Fig. 2

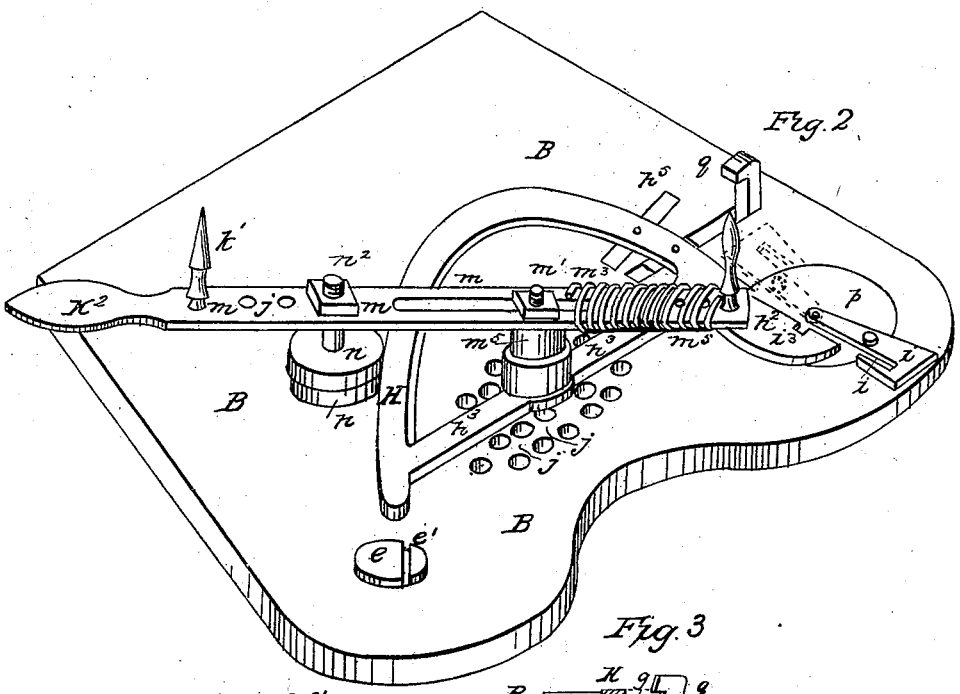
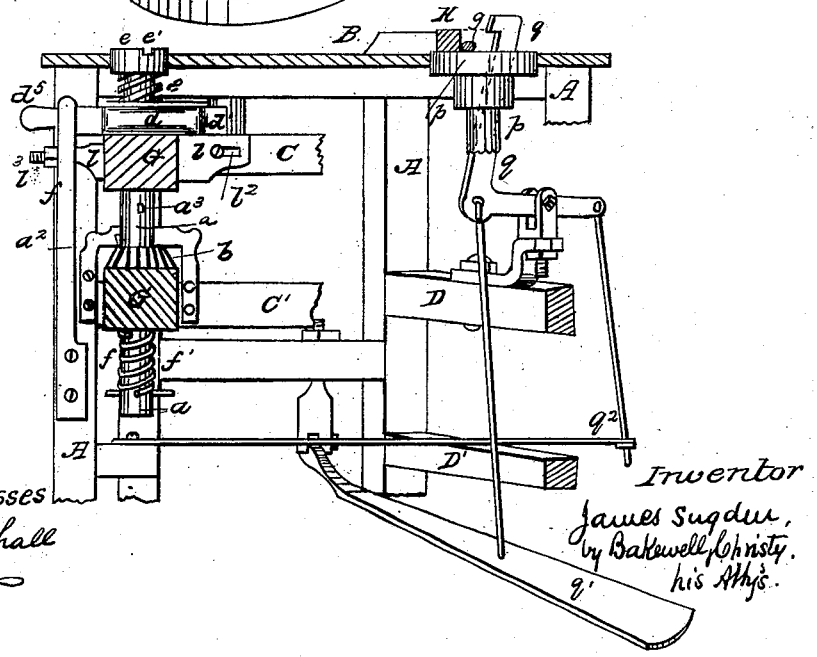


Fig. 3



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3 Sheets—Sheet 3.

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Machine for Bending Rake Teeth.

No. 107,305.

Patented Sept. 13, 1870.

Fig. 4

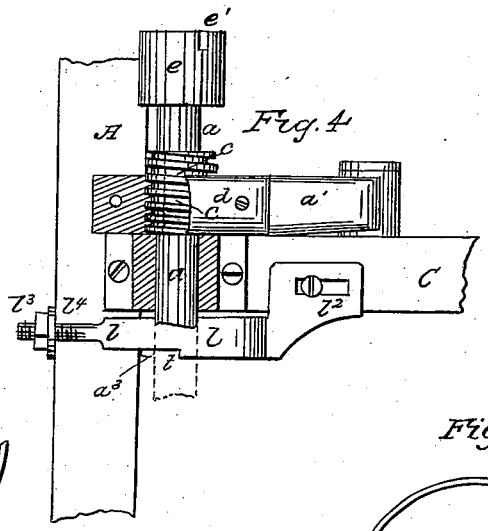


Fig. 13

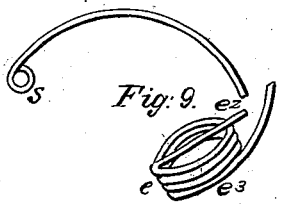


Fig. 9.

Fig. 10

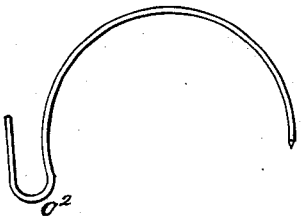


Fig. 11

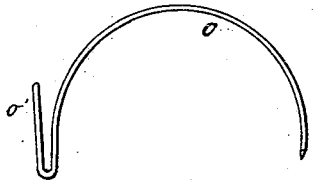


Fig. 12

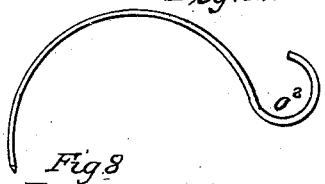


Fig. 8

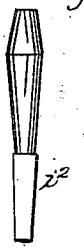


Fig. 5.

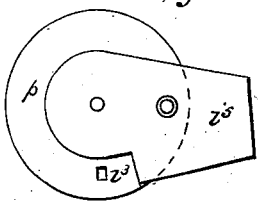


Fig. 7.

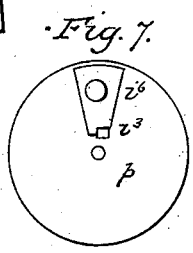
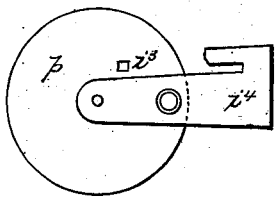


Fig. 6



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JAMES SUGDEN, OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 107,305, *dated September* 13, 1870.

IMPROVEMENT IN MACHINES FOR BENDING RAKE-TEETH.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, JAMES SUGDEN, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rake-tooth Machines; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing in three sheets, said drawing forming a part of this specification, and in which—

Figure 1 is a perspective view of my machine, showing more particularly the devices for making rake-teeth, with a spiral coil or spring at the heel-end;

Figure 2 is a like view of the bending-table and devices for a tooth with a bent heel;

Figure 3 is a detached sectional view of a portion of the operative devices, particularly those required with the apparatus shown in fig. 2;

Figure 4 is a detached elevation of the vertical shaft and coiling-head of fig. 1, and a portion of the operating devices appertaining thereto;

Figures 5, 6, and 7 are plan views of different bending-heads and dies used with the bending devices of fig. 2;

Figure 8 shows a tool to be used therewith; and

Figures 9 to 13 show different forms of rake-teeth.

Like letters of reference indicate like parts in each.

The nature of my invention consists in the construction of an improved machine for making spring rake-teeth from cylindrical metallic rods, bars, or blanks of any desired shape, and with any desired form of bent or coiled or bent and coiled heel parts.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and mode of operation.

The foundation A′ and posts A, of any suitable size or form, support a bending-table, B.

For the purpose of strengthening the posts A, and supporting a part of the operative machinery, I extend cross-beams, C C′ D D′, from one post A to another, in any desired number, order, or arrangement.

At or near one corner of the frame-work thus described, is fastened a U-shaped bearing-piece, G, which supports and in which operate a vertical shaft, *a*, and horizontal shaft, *a′*, the two being connected by bevel-gear wheels *b b′*.

Operative power is applied by means of a crank, *b″*, on the outer end of the horizontal shaft *a′*, or in other known way.

At any suitable point on the shaft *a* is a screw-thread or spiral gear, *c*, which plays into a correspondingly-cut screw-thread or spiral on the inside of a screw-box, *d*, the latter being stationary as regards a vertical motion, but, by an arm, *d′*, at one end, it is hinged to some part of the frame-work, so that, by a handle, *d″*, at its opposite end, or by any suitable tripping device in lieu thereof, it may, at pleasure, be thrown into and out of gear with the screw-thread or spiral gear *c*.

When in gear, it may be held in place by a spring, *f*.

On the upper end of the vertical shaft *a* is fixed a header, *e*, so that the upper end of the latter will project a little above the inclined-faced coiling-plate *g*, which is fastened on the bending-table B.

The upper end of the header *e* has a slot, e^1, for receiving the butt-end e^2, fig. 9, of the tooth-blank, so as, by the rotating of the header, to wind a spiral coil, e^3, in the heel of the tooth, such coil being formed around the header *e*.

In winding this coil, it is necessary that the header *e* should have a vertical motion.

To secure this, I cause the shaft *a* to play up and down through its bevel-gear wheel *b*, the upward motion in coiling being secured by the spiral gear *c d*, already described, and the downward motion, by which the coil so made is discharged from the header *e*, being secured by a spiral spring, *f′*, arranged thereon with suitable stops, which spring brings the shaft *a* down the instant the gear-block *d* is disengaged from the spiral gear *c*.

The rotating of the shaft *a* is secured by a feather, a^2, which plays up and down in a slot in the bevel-gear wheel *b*.

The length of downward fall of the shaft *a* is limited by any suitable catch or stop.

As shown in the drawing, the spiral gear *c* is made on a collar or enlargement of the shaft *a*, which collar or enlargement, as the shaft falls, strikes against the upper bearing of the shaft.

In order to make a greater or lesser length of coil in the heel of the tooth, I vary the length of upward motion of the shaft *a* by means of a pin, a^3, which, when the header *e* has received the desired length of coiled tooth-heel, engages a step, l^1, in the adjustable stopping-bar *l*.

This bar *l* is made adjustable lengthwise by a slot, l^2, at one end, and screw-nuts, l^3, at its other end, which screw against a plate, l^4.

This bar *l* may, likewise, be adjusted vertically by similar means.

On the bending-table B is bolted or otherwise fastened a former, H, the outer edge of which has the curvature desired in the rake-tooth to be made. Its heel-end *h* is adjusted, with reference to the face of the header *e*, so as to leave room between them for the tooth-blank, and the extreme end h^1 of the heel is bent back, so as to act as a stop or gauge in feeding the heel-end e^2 of the tooth-blank into the slot e^1.

To prevent one coil from lapping onto another, I

use a bevel-faced coiling-plate, g, the face of which starts from a thin edge, g^1, where the coiling is commenced, and gradually increases in thickness in a spiral direction around to the edge g^2, where it should be of about the thickness of the tooth-blank.

A lug, g^3, keeps the tooth-blank in place on the side opposite the former H, and acts as a stop to the die n, and the heel-end h of the latter is recessed, as shown, or made of reduced thickness, so that the projecting heel-end e^2 of the tooth may pass over it while being coiled.

The bolt m^1 through the cross-bar h^3, which aids in keeping the former H in place, also extends up through a forming-arm, m, which is secured in place by a nut, m^4, but not so tightly as to prevent the motions hereinafter described.

This forming-bar carries a forming-die, n, which is of cylindrical form, with a notch or groove, n^1, in its lower operative edge, so as to hold the tooth-blank down while bending it against the former H.

To lessen friction, the die n rotates on its shaft n^2, by which it is connected with the arm m.

The opposite end of the arm m has a longitudinal slot, m^2, through which plays the bolt m^1, and a spiral spring, m^3, bearing at one end against the nut m^4 and the sleeve m^5 below, and at its other end, against a handle, k, or other suitable stop, holds the forming-die n up against the blank while bending the tooth, and also allows it to operate at a greater or lesser distance from its center of motion, according to the varying curvature of the former H.

The bar m has other handles, k', as may be desired.

The heel-end e^2 of the heated blank, previously cut to the proper length, is then placed in the slot e^1, the die n is swung around against the stop g^3, so as to press that part of the blank tightly against the former H, when, by turning the crank b^2, a spiral coil, e^3, is made on the header e of any desired number of coils, the necessary length of blank for that purpose being drawn through between the die n and former H.

The die n is then caused to pass around the outside edge of the former H, with the blank inside, and so bend the latter to the shape required.

Then, on the throwing back or out of gear, the screw-box d, the shaft a, and header e, are caused to fall by the action of the spring f', whereby the tooth is discharged complete, and the operation is repeated.

The straight part e^2 of the heel may be made longer or shorter at pleasure, the heel h' of the former H being so shaped as to act as a stop at the distance desired. For this purpose, as well as to make teeth having a body of any desired curvature, the formers used are interchangeable at pleasure.

I have described the shaft as vertical and moving vertically, by which I simply mean that it stands and operates in this respect at right angles to the plane of the former H, without regard to the position of the machine.

The devices thus far described are especially designed for making that form of rake-teeth which have a spiral coil and a straight heel by which to fasten the tooth to the tooth-bar of the rake.

By the use of a few additional devices, I adapt my machine to the manufacture of rake-teeth of all or nearly all desired forms. Such devices are more particularly shown in figs. 2 and 3, sheet 2, where the foundation, frame-work, and bending-table B are the same in construction as those already described.

A vertical shaft, p', carrying at its upper end a bending-block, p, is adjusted so as to be operative in the manner already described, except that it requires no vertical motion.

A former, H', carrying the arm m, and by it the die n, is attached to the bending-table B, as above set forth, and is so adjusted, by the holes j, that a space equal or about equal to the thickness of a tooth-blank will be left between the recessed heel h^2 and the bending-die i, which latter, of the form shown, is fastened to the bending-block p.

To hold the formers H H' in place more securely, a block, h^5, attached thereto, may be seated in a mortise in the bending-table.

The heel-end of a tooth-blank is then inserted between the end h^2 of the former H', and the die i, with its extreme end, in the recess i^1.

A hook, q, operated by a treadle, q^1, and returned to its position by a spring, q^2, as illustrated in fig. 3, may be used to hold the blank o more securely in place.

Then, by power applied through the crank b^2, fig. 1, sheet 1, bevel-gear wheels b^4, and shaft p', the bending-block p is rotated till the die i is in the position shown in dotted lines in fig. 2, thus forming a hook-shaped heel.

To get a well-defined bend at the heel of the hook, a pin, i^2, may be inserted in the mortise i^3 of the bending-block p. This, revolving with the die i and the heel of the tooth, will prevent the blank springing out away from the heel-end of the die i.

The die n is then rotated around, so as to bend the tooth-blank against the former H', as already described.

The tooth is then complete.

The form of tooth thus made is shown in fig. 11, o being the body, and o^1, the heel-end, bent as described.

In this connection, to make bent heels of other forms, correspondingly-shaped dies may be used instead of the die i.

Thus, for the form of tooth shown in fig. 10, where a less abrupt curve is made at the base, o^2, of the heel, the die i^4, fig. 6, is used, with the same pin, i^2, inserted in a like mortise, i^3.

The die i^5, fig. 5, is substituted for the die i, to make the tooth shown in fig. 12, where a curve, o^3, of longer radius, is desired.

No other change is needful in the machine to make these and other similar forms of teeth, except the change of bending-dies and the proper adjustment of the former H' with reference thereto.

In like manner, by the use of a die, i^6, a tooth is made of the form shown in fig. 13, an eye, s, being merely turned at the heel.

The form of these dies may be varied to any desired extent, so as to bend heels of any desired form.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with the vertically-moving and rotating shaft d, the slotted coiling-header e and bevel-faced coiling-plate g, constructed and operated substantially as and for the purposes set forth.

2. The combination of the shaft a, carrying the slotted header e, with spiral gear and nut d, and suitable mechanism for rotating said shaft.

3. In combination with the coiling-shaft a, nut d, and mechanism for releasing it, the spring for producing an abrupt downward motion, substantially as described.

4. The combination of the former H with shaft a, and head e, and beveled plate g, for the purpose described.

5. The former H, in combination with the stop g^3 and die n, for the purpose described.

6. In combination with the slotted header e, the former H and the stop h^1, the latter being integral with said former H, for determining the length of the straight heel part, e^2, of the tooth, substantially as described.

7. In combination with the former H or H', the

oscillating and longitudinally-moving arm *m*, with spring and roller-die, substantially as and for the purposes described.

8. The revolving bending-block *p*, with the mortise i^3 and the bending-die, in combination with the pin i^2 and the former H′, for the purposes described.

9. A hook, *q*, in combination with the subject-matter of the last preceding claim, arranged and operated substantially in the manner and for the purposes described.

In testimony whereof, I, the said JAMES SUGDEN, have hereunto set my hand.

JAMES SUGDEN.

Witnesses:

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R. C. WRENSHALL.