C. D. ROGERS.

APPARATUS FOR PICKLING WIRE.

No. 186,956. Patented Feb. 6, 1877.

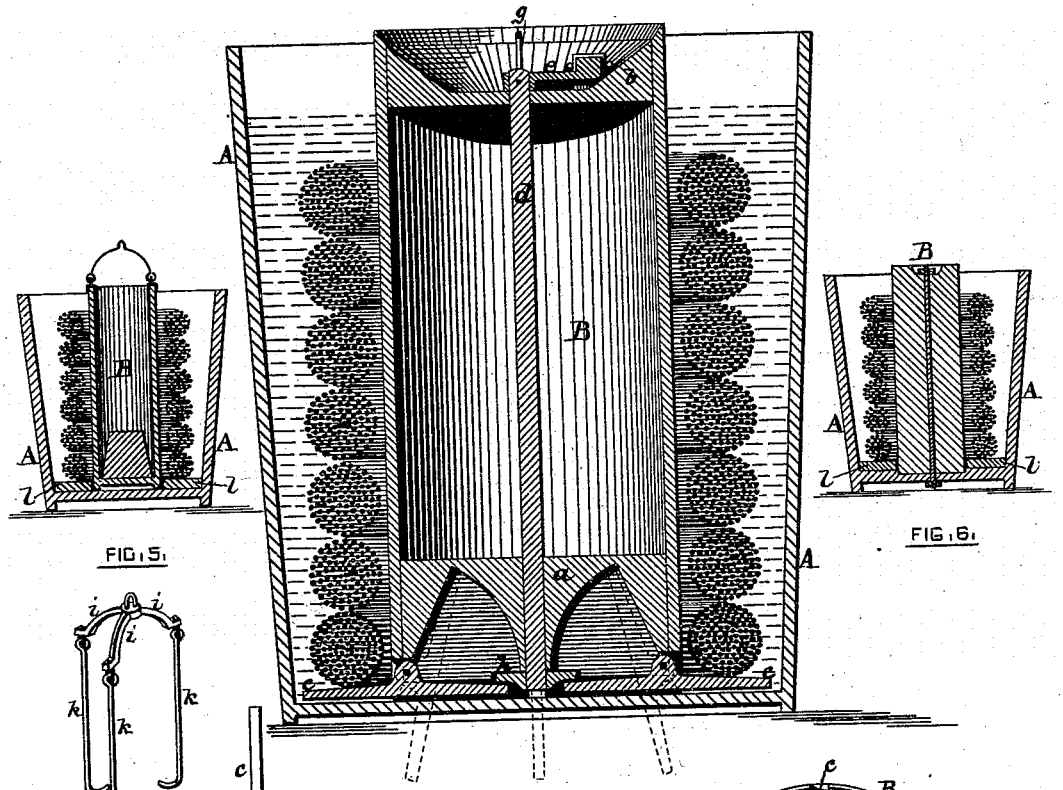

FIG. 1.

FIG. 5.

FIG. 6.

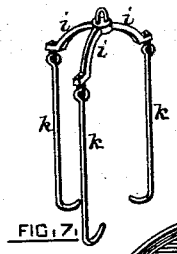

FIG. 7.

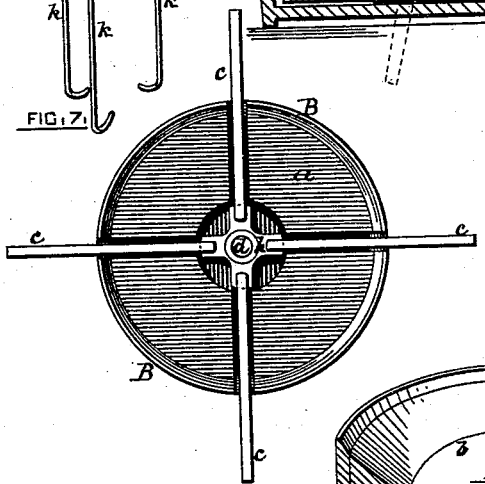

FIG. 3.

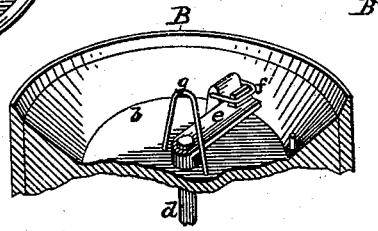

FIG. 2.

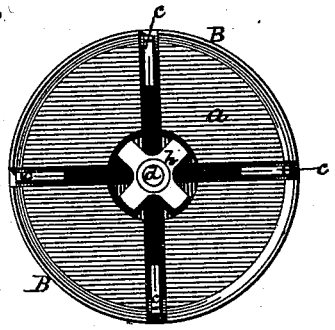

FIG. 4.

WITNESSES.

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IMPROVEMENT IN APPARATUS FOR PICKLING WIRE.

Specification forming part of Letters Patent No. **186,956**, dated February 6, 1877; application filed December 23, 1876.

To all whom it may concern:

Be it known that I, CHARLES D. ROGERS, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in Apparatus for Pickling Wire; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description thereof.

It is well known that, preparatory to cold-drawing iron wire, it is necessary that it be subjected to the corrosive action of an aqueous solution of sulphuric acid. This operation is commonly known as "pickling."

The wire, when prepared for pickling, is in coils of practically the same diameter. Originally a single coil was immersed in the solution and removed before putting in another. This mode involved much waste of acid, and was very laborious and expensive. Subsequently, circular tubs or vats of considerable depth were used, in which numerous coils of wire were placed, one above the other, in a stack, and vertical skeleton hoisting-reels were used for simultaneously putting these coils into the tubs and removing them therefrom. This last-named apparatus has been used for a long time with great practical saving in acid and labor, as compared with the previous method.

The acid and water are mixed in the vat, and the wire immersed therein. Steam is then applied for attaining more heat in the liquor than that incident to the action of the acid on the water. The desirable corrosive action on the wire is best attained during the active operation of the acid upon the water. Numerous experiments and long practice have determined the most effective proportions of acid and water; but I have discovered that the quantity of wire which can be successfully pickled in a solution of the requisite strength depends upon its immersion in the liquor during a certain period next after the mixing of the acid and water, independent of the quantity or volume of the solution, provided that the wire be submerged therein. In other words, I have discovered that a certain quantity of wire can be properly pickled in a solution of a given strength which is much less in quantity than has been, and is, essential with pickling apparatus as heretofore employed. The lessening in the bulk or quantity of the pickling-liquor involves a saving of acid and a saving in steam required to heat it. The lessening of the volume of liquor and the performance by it of practically the same corrosive work which the greater volume is capable of performing results in a spent liquor, which is rich in sulphate of iron, and of practical value in the production of copperas therefrom. On the other hand, the spent liquor, when the solution is applied as formerly, has no value whatever in this connection. There is also economy in the handling of the lesser quantities of water and acid.

For the practical attainment of these economical results I have invented a novel pickling apparatus, the main feature of which consists in the combination, with a suitable vat, of a vertical column, which occupies the central space inclosed by the coils of wire when in position for pickling. This column performs only a displacing function, and its presence in the vat causes the liquor to be so displaced that it has a greater depth, and consequently more coils of wire can be submerged by a certain quantity of liquor than would be possible in the same vat without the column. This column may be of any form, but preferably circular. It may be attached to the vat or wholly separate therefrom, or it may be made as a part of the hoisting-reel, whereby numerous coils of wire in a stack may be readily put into and removed from the vat.

A minor feature of my invention consists in a hoisting-reel provided with a displacing-column, so that, as a laden reel is lowered into a vat partially filled with liquor, the displacement thereof will be such as to secure the submerging of the upper coil on the reel, the liquor being forced upward into the annular space between the column and the walls of the vat.

To more particularly describe my invention, I will refer to the accompanying drawings, in which—

Figure 1 represents, in vertical central section, my improved pickling apparatus, in which the displacing-column and hoisting-reel are combined. Fig. 2 represents the top of the reel, partially in perspective, and in vertical section. Fig. 3 represents the bottom of the reel with the arms extended and locked. Fig. 4 represents the same with the arms released from the catch-plate. Fig. 5 represents, in central vertical section, a pickling-tub with a displacing-column which is detachable. Fig. 6 represents, in central vertical section, a tub having a column which is attached to the bottom of the tub. Fig. 7 represents, in perspective, a hoisting-reel adapted for use with tubs, Figs. 5 and 6.

A denotes the tub. It is usually made of wood, slightly tapering, and heavy enough to withstand the severe usage incident to pickling. I prefer that its average diameter be about six inches greater than the outside diameter of the coils of wire to be pickled.

As it is important that the quantity of solution be reduced as far as possible, the tub will preferably be circular; although if square, and used with the column, good results will be attained, so far as they may be due to the displacement of liquor by the column.

B denotes the displacing-column. As shown in Fig. 6, it may be a solid column secured to the bottom of the tub by a central bolt. As shown in Fig. 5, it may be a hollow water-tight cylinder, of metal or wood, provided with a bail or other means for conveniently removing it from the vat or placing it therein. It should be weighted, so as to secure its descent through the liquid to the bottom of the tub.

In Figs. 1 to 4, inclusive, the column B is shown to constitute a part of the hoisting-reel. It is a hollow iron cylinder, with a heavy base at *a*, and a concave head at *b*. The base, at its under side, is recessed in radial lines, for the reception of the arms *c*, which are pivoted centrally to the column at its base. These arms extend from a point near the center of the column outwardly, so as to afford a good support for the lower one of several coils with which the reel may be loaded. A central shaft, *d*, in the column, is provided at its upper end with a lever, *e*, with which a loop-catch, at *f*, is arranged to engage, for preventing rotation of the shaft.

The shaft should be packed at the base *a*, to prevent leakage into the column. A bail or eyebolt, as at *g*, is provided, for connection with hoisting-tackle. The lower end of the shaft *d* is provided with a four-armed catch-plate, *h*. Its arms extend outward beyond the inner ends of arms *c*. When the arms of the catch-plate are opposite the radial recesses the arms *c* engage therewith, and are thereby maintained in a horizontal position, for supporting the coils of wire, as shown in Figs. 1 and 3; meantime, the catch-loops *f* secure these parts in this position. After the reel, laden with coils of wire, has been hoisted from the tank and placed on the ground, the shaft *d* is rotated, the arms *c* released, and the reel hoisted, leaving the coils standing in a stack, convenient for washing and dripping. When released, the arms *c* and catch-plate occupy positions shown in Fig. 4 and in dotted lines in Fig. 1. When placed endwise on the ground, the arms *c* assume a horizontal position; the shaft and catch-plate are then rotated, and the loop-catch adjusted, after which another lot of coils of wire may be loaded on the reel.

When the column B is attached to the tub, as in Fig. 6, I employ a hoisting-reel like that shown in Fig. 7. It consists of a three-armed head, as at *i*, and three strong hooks, *k*, swiveled to the head, so that they may be freely turned in any direction. The bottom of the tub is provided with several radial bars, as at *l*, which keep the lower coil from contact with the bottom of the tub. A stack of coils is hoisted from the floor on the hook-reel, and lowered into the tub. When the column B is detachable, and is not a part of the reel, as in Fig. 5, the hook-reel or the column-reel may be used for putting the stack of coils in the vat. On removing the reel, the detachable column is inserted until the pickling operation is completed.

However the column B may be constructed, it should have a diameter, say, from two to three inches less than the inside diameter of the coils of wire to be pickled. As a rule, the coils vary but little in diameter, owing to the uniformity in the size of the coiling-drums in drawing-machines.

From this description of the apparatus it will be seen that the essential feature of my invention is an annular chamber, in which the coils of wire may be placed and submerged in a minimum quantity of pickling-liquor, provided sufficient space be afforded for a free circulation of the liquid about the coils.

The practical value of my invention will be fully comprehended when I state that from experiments with vats with and without a displacing-column, all other things being substantially equal, and each being made to perform the same pickling service, it was demonstrated that the quantity of acid required for pickling about twelve thousand pounds of wire was as two hundred and seventy-six (276) pounds of acid to five hundred and twenty (520) pounds in favor of the tubs with the column. The spent liquors from the column-tubs afford a large quantity of copperas crystals, and those from the other tubs afford none. The annular space in the column-tub is peculiarly favorable for the exposure of the wire, and for the circulation of the liquor in contact therewith. As a lesser quantity of solution is requisite, it involves much saving in steam for heating it. The requirement of a lesser quantity of acid and water involves less labor in handling, and less time for filling and emptying the tubs. Moreover, while the

spent liquors of the old tubs have no capacity for properly corroding or etching the wire, they have a slightly greater quantity of acid remaining than in the spent liquors from the column-tubs.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with a wire-pickling tub or vat, of a displacing-column, occupying the central space inclosed by the coils of wire, substantially as described, and for the purposes specified.

2. A hoisting-reel provided with a displacing-column, substantially as described.

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