2 Sheets—Sheet 1.

D. FRANKLIN.

APPARATUS FOR BENDING AND HARDENING MOLD-BOARDS.

No. 194,423. Patented Aug. 21, 1877.

Fig. 1.

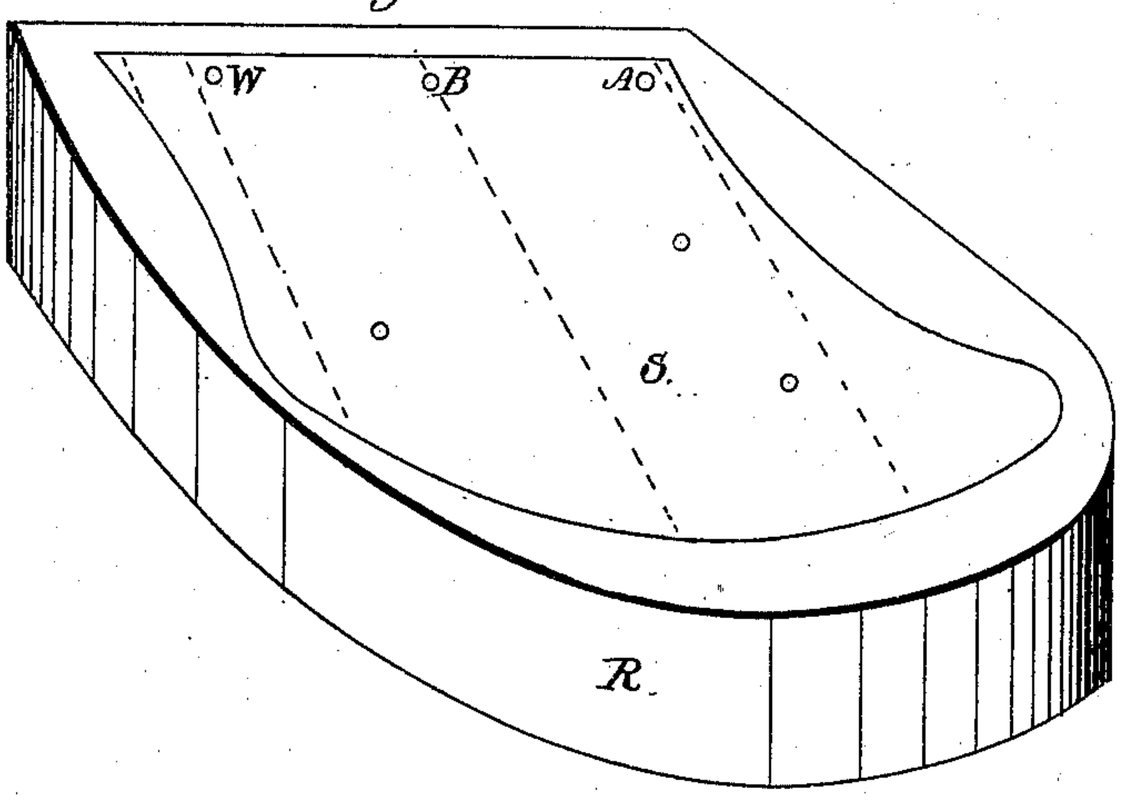

Fig. 5.

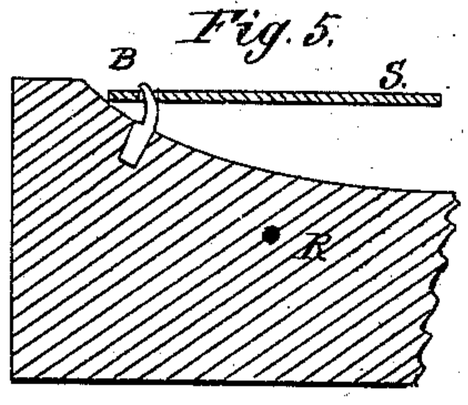

Fig. 6.

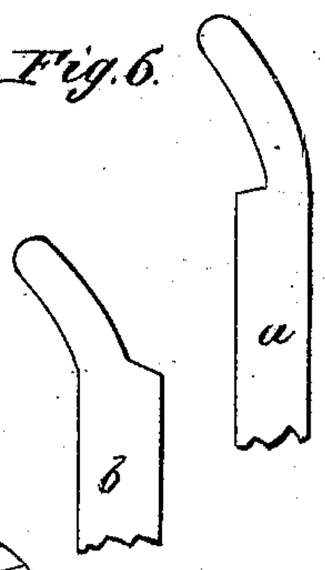

Fig. 2.

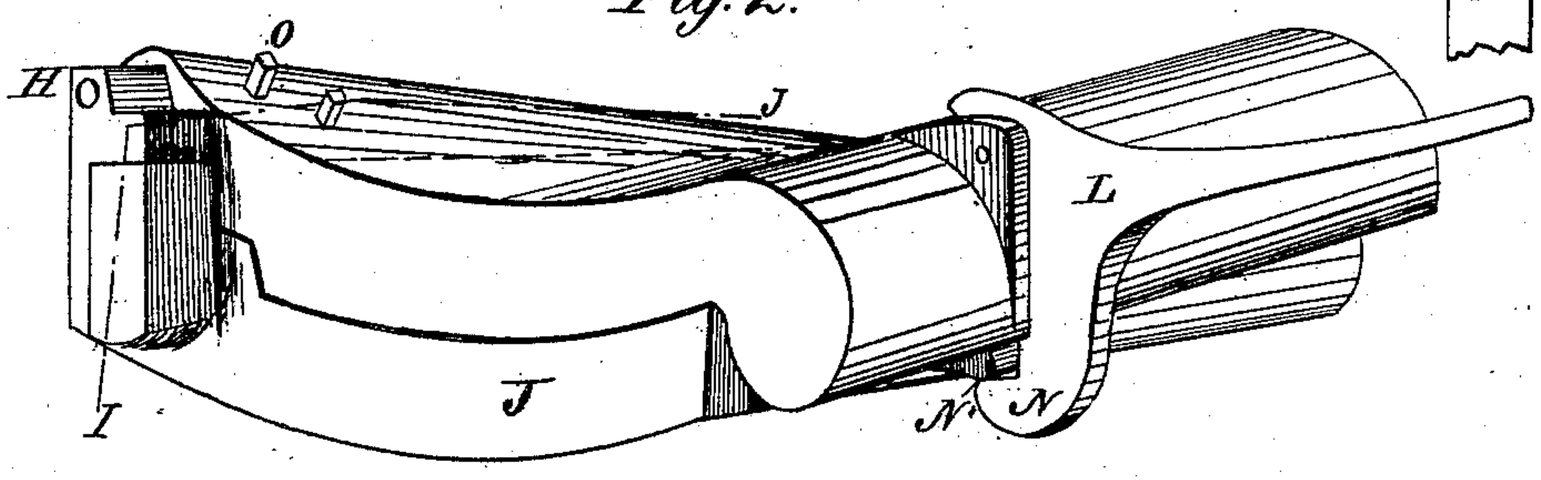

Fig. 4.

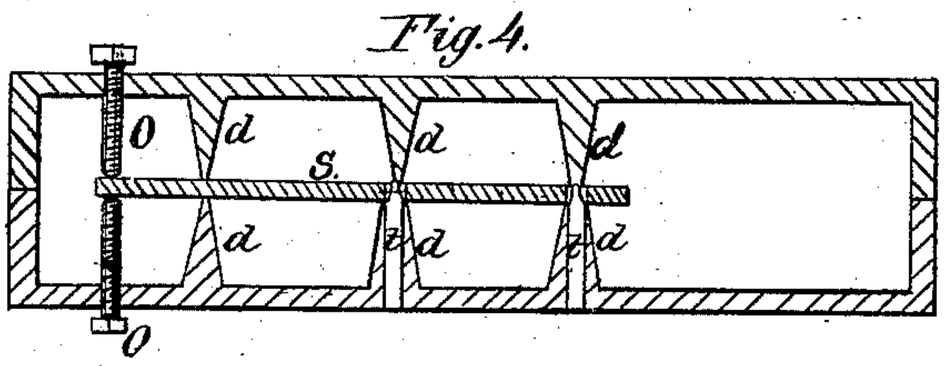

Fig. 3.

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2 Sheets—Sheet 2.

D. FRANKLIN.

APPARATUS FOR BENDING AND HARDENING MOLD-BOARDS.

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Fig. 7.

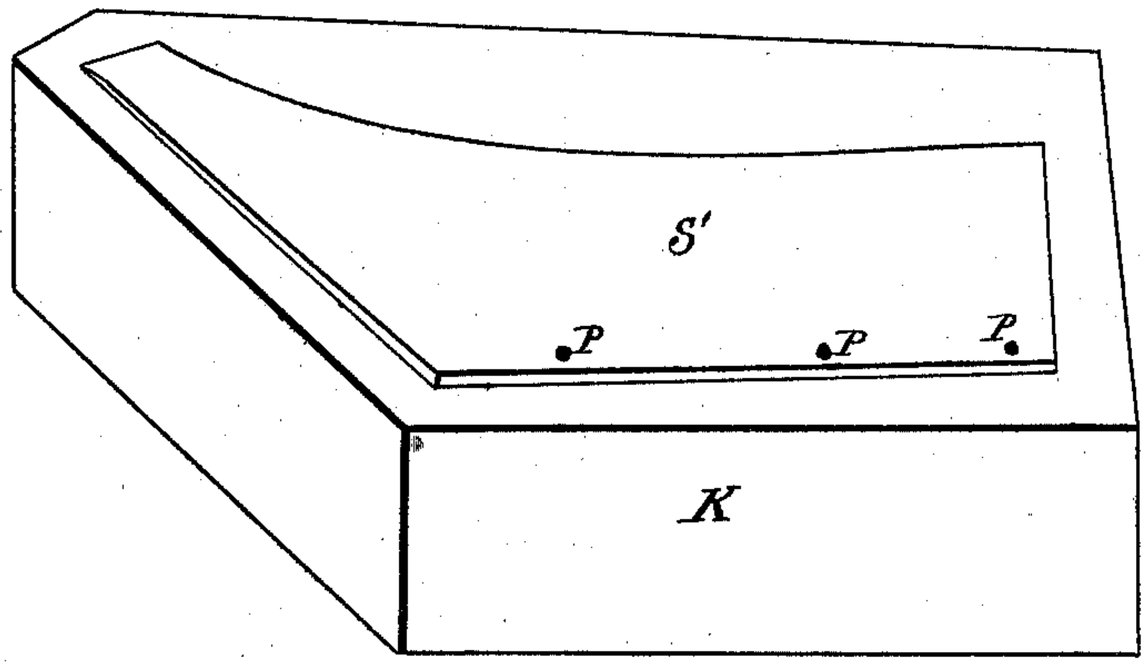
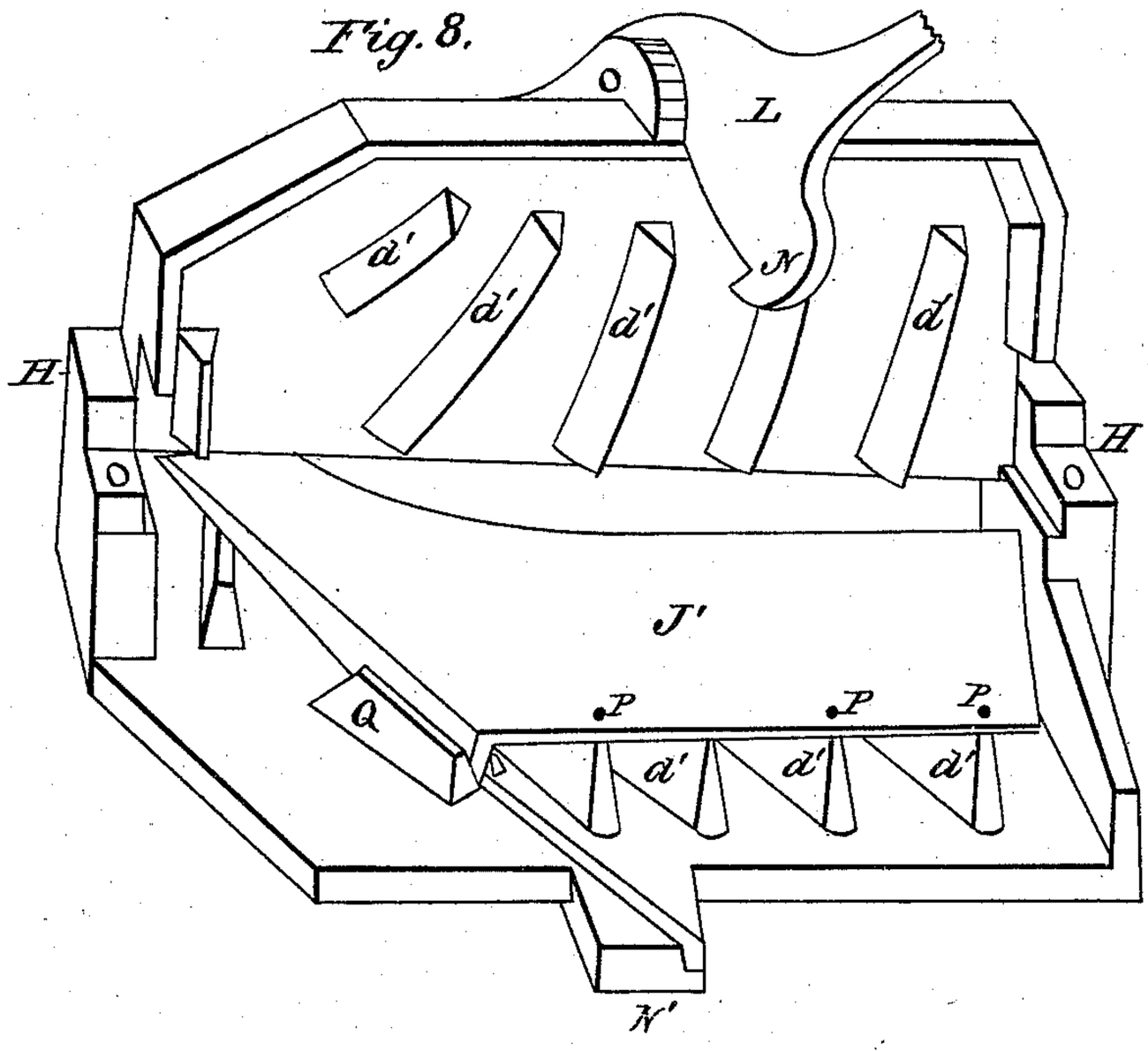


Fig. 8.



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UNITED STATES PATENT OFFICE.

DAN FRANKLIN, OF TAMA CITY, IOWA.

IMPROVEMENT IN APPARATUS FOR BENDING AND HARDENING MOLD-BOARDS.

Specification forming part of Letters Patent No. **194,423**, dated August 21, 1877; application filed March 16, 1877.

To all whom it may concern:

Be it known that I, DAN FRANKLIN, of Tama, county of Tama, State of Iowa, have invented an Improved Apparatus for Bending and Hardening the Mold-Boards and Shares for Steel Plows, of which the following is a specification:

My invention consists in improvements in the cast-iron dies used in a drop-press for bending mold-boards and shares for steel plows, and in a tempering-form for holding the mold-boards and shares while being hardened; and reference is made to the accompanying drawings, which form a part of my specification.

Figure 1 of the drawings represents the mold-board S lying on the die R after the edge of the mold-board which joins the share has been planed, and the bolt-holes at A, B, W., &c., have been punched and countersunk.

In my method of procedure the board is first planed, then the holes A, B, and W are to be punched, and in exactly the same position in all mold-boards of the same class of plows, and are used as guide-holes through the rest of the process. In the lower die R two steel pins are set for guides, in such position and of such shape that they enter the guide-holes A B in the mold-board, and keep it from changing its position when the upper die strikes it and passes it down into the lower die. As the mold-board blank lies on the die R before bending, Fig. 5, the guide-pins do not project above the mold-board, but only enter the holes A B far enough to secure a firm hold. The shape of the guide-pins is shown in Fig. 5, which represents a vertical central section of a fragment of the mold-board S and lower die R. The guide-pin must be curved, so that it shall pass through the hole B nearly at right angles to the mold-board in all its positions while bending, and at the same time be inclined outward enough to allow for the drawing action of the mold-board as it bends down in the middle. These guide-pins are further shown in Fig. 6. Here there are shoulders shown upon the pins upon opposite sides. These guide-pins are interchangeable, and the position of the mold-board upon the die may be changed by changing the guide-pins, one for the other, and, as every change in the position of the mold-board changes the shape given to it by the dies, it is easy to obtain from the same dies several different shapes of mold-boards with perfect certainty and uniformity. Of course the holes A W may be used as guide-holes in place of the holes A B. But to obtain a very small "twist" in the mold-board, a supplementary hole may be drilled in the lower die R, farther from the share-edge thereof, upon the arc of a circle described from the pin at A, and having the radius A W. The mold-board would be then swung on the pin entering hole A as a center, and the pin set in said supplementary hole would of course enter the hole W in the mold-board. The upper die, (not shown,) whose curvature corresponds to that of the lower die R, has small slots in it to receive the curved ends of the guide-pins of the lower die.

Without these guide-pins at A B, the mold-board, owing to its uneven bearing upon the die, to the twisting shape of the dies, and to unequal heating, will not bend equally in all parts, and shifts its position more or less in the dies by twisting around horizontally, so that the same dies are always liable to form mold-boards which differ in shape.

Many attempts have been made to remedy this trouble by using raised shoulders in the dies, against which the blank board is placed; but the instant the board begins to bend down in the middle its edges draw away from the shoulders, and they no longer prevent it from turning, so that the remedy is only partial at best. But by the use of the two guide-pins this difficulty is entirely obviated, and the mold-boards all come out of the dies exactly alike for any given position of the guide-pins.

It is essential that these pins should be short, not projecting above the die over two inches, so that the blank can be easily placed on the die, and be quickly removed after the drop-press has struck its blow, before it has lost heat enough to unfit it for the next step in the operation, for the heavy cast-iron dies abstract heat so rapidly from the thin mold-

board that, if it were left in contact with them long enough first to place, and, after the blow of the drop, to withdraw, long movable pins or rods, the board would be too cool for the tempering process.

Immediately after the mold-board has been stamped in the press it is to be taken out and placed in the tempering-form, which is shown closed in Fig. 2 and open in Fig. 3, and in section in Fig. 4. This tempering-form is designed to subject all parts of the mold-board at once to the powerfully-hardening action of a swift jet or stream of water, and at the same time prevent its warping. It is a cast-iron box, made of two upper and lower parts, about four inches deep, and long and wide enough and curved to such a shape as to easily hold the forms of mold-boards desired. The two parts or halves are hinged together in some suitable manner at the back corners, as at H in Fig. 2, so that the upper half of the form turns up and backward.

The back side of the form is entirely open, as is also the front side of the lower part. While the sides fit tightly together the upper half projects about four inches over the lower part in front, and is curved downward, as is shown in Fig. 2. Inside of the tempering-form are thin sharp-edged ribs on both top and bottom parts, running from back to front, so as to cross the mold-board parallel with the dotted lines in Fig. 1. These ribs are designed to gripe the mold-board and hold it while a swift stream of cold water passes through the form between the ribs, from back to front, both over and under the mold-board, and hardens it.

The tempering-form should be placed at the mouth of a wide spout leading from an elevated tank, so that the water will pass through the form under considerable pressure, and thorough contact of the water with the hot mold-board is insured by making the tempering-form more shallow in front than at the rear end; in other words, the spaces or passages through which the water passes are deeper at the entrance or rear end of the form than at the exit or front end thereof. The curved front of the upper half of the form directs the stream of water down into a tank, out of the way. Of course the elevated tank is so arranged as to turn on and shut off the water at will, and by using a swift jet of water confined to the surface of the mold-board, as it is in the tempering-form, with an outlet a little smaller than its inlet, and which, because of its swiftness, expels all air and the hot water as soon as it is formed, it is possible to harden more quickly and evenly, and secure a much harder surface, than by the common method of dipping the mold-board into a tank.

The inside structure is more fully shown in Fig. 4, which is a sectional view taken in the dotted line I J of Fig. 2. Here the ribs *d d d* of the upper half of the form are shown with corresponding ribs below on the lower half of the form, but upon the point of the mold-board two or more set-screws, O O, are used.

The mold-board S is shown in position, and the section is so taken that it passes through the guide-holes A B of Fig. 1. The position in which the mold-board is placed in the tempering-form is governed entirely by two guide-pins, *t t*, which enter the guide-holes A B of Fig. 1. These guide-pins, which are modified forms of those used in the dies and shown in Fig. 6, being shorter and not curved, pass up through holes drilled in the lower half of the form, and are removable and interchangeable, and have short straight necks, not exceeding one-half inch in length, and shoulders on one side, and are used to govern the position of mold-board in the tempering-form exactly as are the guide-pins in the die in Fig. 1. Or if the holes A W of the mold-board are used as guide-holes in the bending operation, then the same holes may be used as guide-holes in the tempering-form, the position of the pins *t t* being changed correspondingly. The thickness of a mold-board at its point varies, as it is single or double shinned, and the lower set-screw O accommodates this variable thickness, and the screws should be so set that the upper one is slightly lower than the upper ribs. The function performed by the screws is twofold: First, they supplement and perfect the action of the dies in giving a slight downward bend to the point of the mold-board; and, second, they prevent it from warping while being hardened.

The object of this curve is that when the parts of the plow are bolted together the bolt through the hole W in Fig. 1 will spring down the edge of the mold-board till it is even with the edge of the share, and this will cause the point of the board to press solidly upon the land-side, thus securing a perfect fit of the mold-board to both share and land-side.

The edges of all the ribs should be as sharp as is consistent with strength, so as not to shield the mold-board from the action of the water. By using this closed tempering-form with four or more thin ribs and the set-screws described, both objects desired—which are, subjecting all parts of the mold-board to the action of a swift jet of water, and at the same time preventing all warping or springing—are easily accomplished.

The tempering-form is opened and locked fast by the lever L, which is of the shape shown in Fig. 3. It is pivoted to two lugs cast upon the upper part of the form, as shown in Fig. 2.

The lower part of the lever, at N in Figs. 2 and 3, locks under a lug, N′, cast on the front part of the lower half of the form. When the handle of the lever is lifted it unlocks from the lower part, and when the point of the lever strikes the top of the form the upper part turns up and back.

I am aware that various tempering-forms

have been tried and are used; but they are all heavy, cumbrous affairs, requiring the use of a chain and pulley to hoist them up and lower them into a tank; and since the mold-boards, having been stamped in dies without guide-pins, are never uniform in shape, and no guide-pins are used in the forms to insure putting the mold-boards into them alike, it is always necessary to depend partly upon the form when clamped together for bending the boards into shape. This fact obliges the ribs to have wide bearings, for if sharp-edged they would cut into the soft steel when bending it. Besides, these thick ribs prevent the water from acting upon the board where they cover it, so that boards hardened in these forms are very liable to show soft spots.

Another serious defect is, the water cannot find ready access to the board, because of these thick ribs and the frame-work supporting them, and for the same reason hot water cannot readily flow off and give place to fresh cold water, so that these forms have never come into general use.

My apparatus remedies all these difficulties by using a stationary form adapted for forcing a stream of water through it under heavy pressure, and fitted with thin sharp-edged ribs, allowing fullest access of water to all parts. These sharp-edged ribs never cut into or mar the surface of the board; for by the use of the guide-pins in the dies for bending, and again in the form itself, the boards are all stamped in the same shape, and lie in the form in the same position, so that the ribs do not bend them, but simply preserve the curvature imparted by the dies. In fact, the use of the guide-pins, both in the dies of the drop-press and in the form itself, is vitally necessary to the successful use of any kind of tempering-form with sharp-edged ribs.

It is evident enough that the more quickly the operations of stamping the board in the drop-press and placing it in the water are performed the less heat it loses, and the harder it will be.

When the guide-pins and my tempering-form are used, only one blow requires to, or should, be given in the drop-press instead of two or more, as is usual, and the whole operation of bending and hardening is performed in less than half the usual time.

I pursue the same process in the bending and hardening of the shares as with the mold-boards, the only difference in the apparatus being that which is caused by the difference in the size and shape of the parts.

In Fig. 7 the share S′ is shown lying on the die ready for the blow of the drop. Two or three short guide-pins, P P P, govern its position on the die by entering the bolt-holes. These pins are not interchangeable, as it is not necessary to produce shares of different shapes, as in the case of mold-boards.

When shares are to be hardened the tempering-form shown in Fig. 8 is used. It is shown open with the share in position, which position is fixed by the guide-pins at P P P. Thin sharp-edged ribs d' d' d' cross the top and bottom of the form, and one additional rib, Q, is used, with a slot cut in it to hold the land-side from warping. This tempering-form is arranged and designed in all its details for forcing a stream of water through it under heavy pressure, as in the form for mold-boards.

The great object attained by the use of the guide-pins and tempering-forms is the uniformity and interchangeableness of the mold-boards and shares when finished, which makes it possible to set up and finish the plows with less labor and grinding than are now necessary, and will also enable the manufacturer to send one or more duplicate shares or mold-boards with every plow put into market. My apparatus also renders possible a great economy in time, labor, and fuel.

In the usual process of making mold-boards they are allowed to get cold after being stamped in the drop-press. The parts of the plow are then fitted and bolted together, and the plow is ground, in part at least; then it is taken to pieces, and the mold-board is reheated and hardened, with the frequent result that it warps and springs so much that it requires more fitting and grinding than at first.

In my method the work of stamping th mold-board in the drop-press and hardening in the tempering-form is all done at one heat, saving all the time, labor, and fuel, and wasting away of the steel caused by the reheating, and securing a much higher temper in the steel than is possible after reheating it, because the blow of the drop and the bending of the board compact the metal, making it denser on the wearing or front surface, and break off all the scale, so as to expose the clean surface of the steel to the action of the water.

Although by my process, the setting up and grinding of the plow is done after hardening, yet the fitting of the parts secured by the use of my apparatus is so perfect that the amount of grinding is much less than by the common method.

What I claim is—

1. The combination of the two short curved and interchangeable guide-pins with cast-iron dies, for bending mold-boards, said pins being in the lower die, near its share-edge, as and for the purposes before described.

2. The tempering-form for mold-boards, consisting of an iron box, made in two parts, hinging and locking together, and provided with the sharp-edged ribs and intervening channels, also having open ends and closed sides, and constructed or made more shallow at its front end, to adapt it for receiving a stream of water forced through it under pressure, substantially as and for the purpose specified.

3. The combination of the two short and and straight guide-pins *t t* with the two-part tempering-form for mold-boards, provided with the ribs *d d d* and channel and open ends, as and for the purpose before described.

4. The combination of the set-screws O O with the tempering-form for mold-boards, provided with the ribs *d* and channels and open ends, as and for the purposes before described.

DAN FRANKLIN.

Witnesses:
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G. H. WARREN.