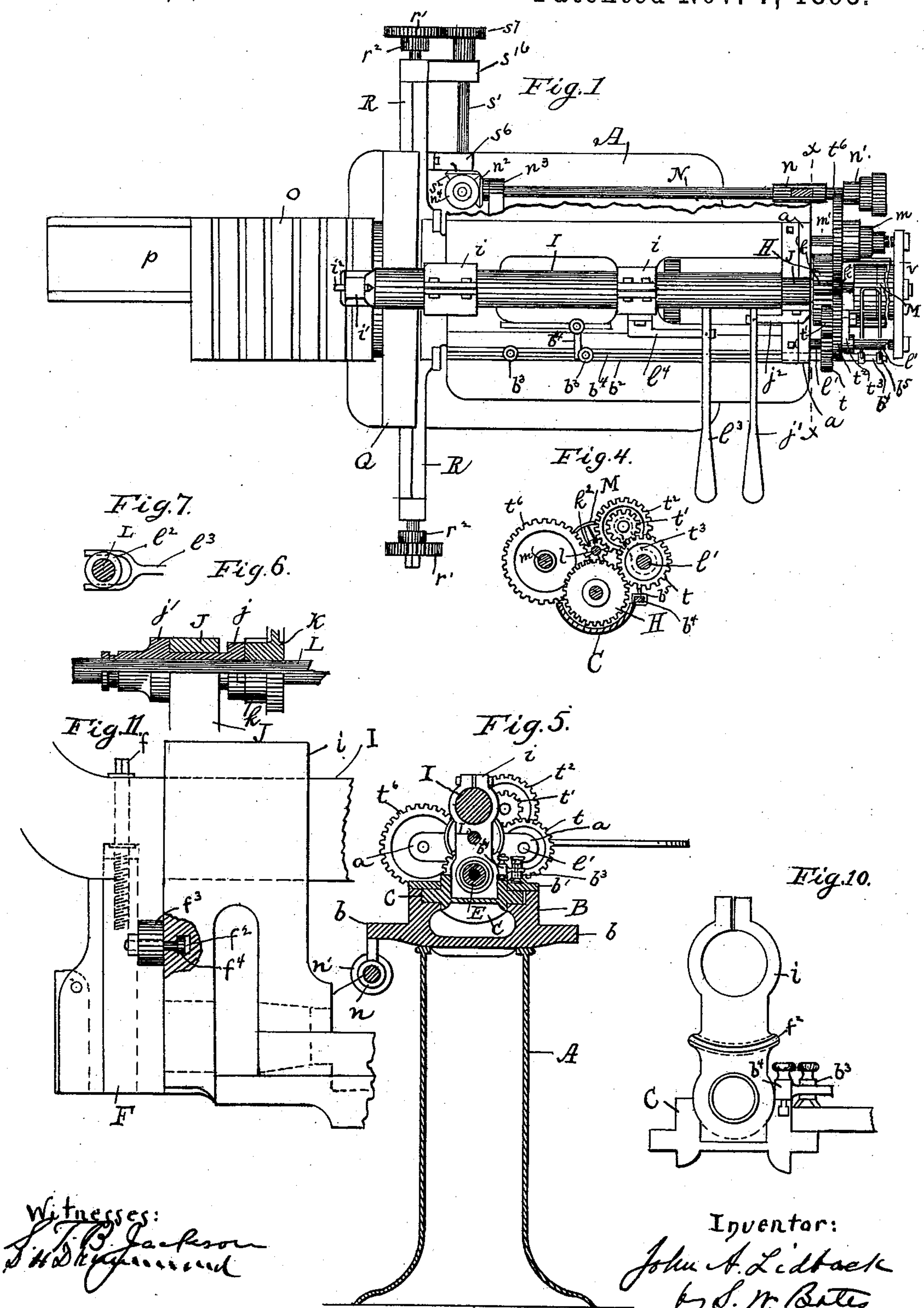
(No Model.) 2 Sheets—Sheet 1.

J. A. LIDBACK.

COMBINATION METAL WORKING MACHINE.

No. 508,029. Patented Nov. 7, 1893.



Witnesses:
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Inventor:
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THE NATIONAL LITHOGRAPHING COMPANY,
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

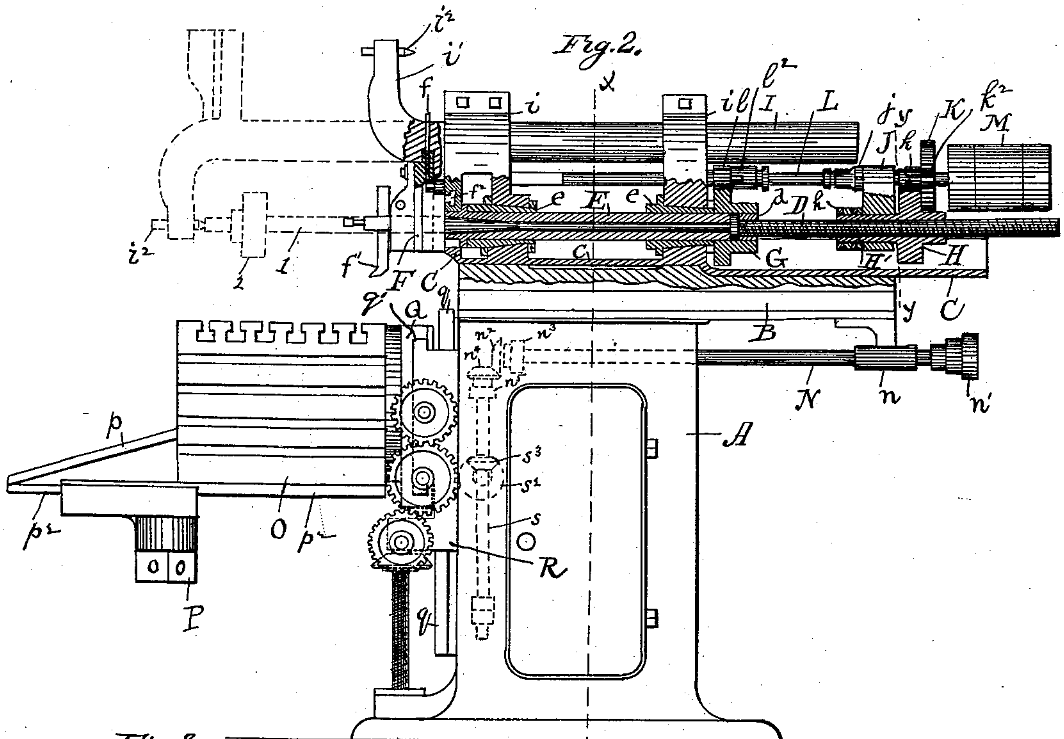


Fig. 8

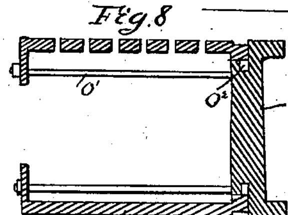


Fig. 12.

Fig. 3.

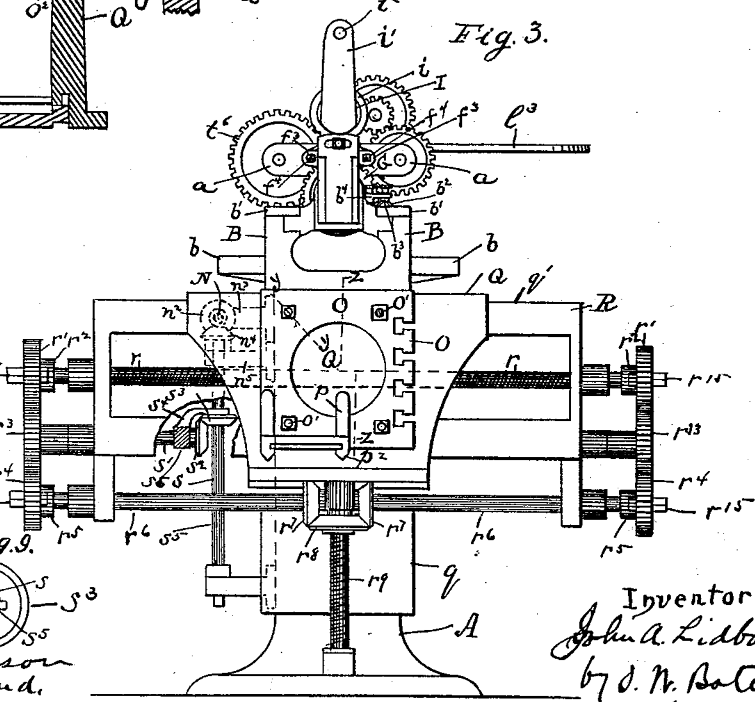
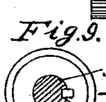


Fig. 9.



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THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN A. LIDBACK, OF PORTLAND, MAINE.

COMBINATION METAL-WORKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 508,029, dated November 7, 1893.

Application filed September 6, 1892. Serial No. 445,189. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. LIDBACK, a citizen of the United States, residing at Portland, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Combination Metal-Working Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a machine for doing a large variety of work such as is ordinarily done in a machine shop.

The object of the invention is to construct a single machine which shall be capable of use in shaping, boring, drilling, planing, screw and gear cutting, and many other kinds of work.

As metal working machines are now made and used in a machine shop, many of them remain idle a great part of the time. My machine being adapted for many different kinds of work is designed to be always in use on one kind or another.

The principal features of the machine are a shaper bar or sliding headstock having a spindle mounted therein, a supporting bar for the tool stock having an offset for supporting the outer end of the tool arbor and a revolving table which has several faces for holding different kinds of work, and which also has lateral and vertical feed.

I illustrate my invention in the accompanying drawings, in which—

Figure 1 is a plan of my machine. Fig. 2 is a part side view and part central vertical section with certain parts omitted. Fig. 3 is a front view. Fig. 4 is a section on X X of Fig. 1 and Y Y of Fig. 2. Fig. 5 is a section on X X of Fig. 2. Fig. 6 is a detail of one of the clutches. Fig. 7 is a detail showing clutch, and lever which operates the same. Fig. 8 is a section on Z Z of Fig. 3. Fig. 9 is section immediately above the gear S^3 showing its connection with the shaft. Fig. 10 is front view of end of the sliding headstock. Fig. 11 is side view of the same. Fig. 12 is a section on Y Y of Fig. 3, showing manner of securing the table to the apron.

A represents the framework or stand on which the machine is mounted.

B is the bed piece or base of the machine, it being secured to the top of the stand A.

On the bed piece B is the sliding headstock C which performs the same functions as the shaper bar in a shaping machine when my machine is being used as a shaping machine and as a headstock when my machine is used as a milling machine. The headstock is held in guides in such a manner as to be capable of sliding on the bed piece. It is held down by side plates b' bolted to the top of the bed piece, (Fig. 3.) On the sides of the sliding headstock I have formed brackets or shelves b for convenience in holding tools. Two upright bearings i i are formed on the headstock and in the lower portion of these bearings is journaled the spindle E which is preferably made hollow. e e are the bushings in which the spindle E turns.

The spindle E is rotated by means of a gear G which is secured to it as here shown immediately in the rear of the rear bearing i. The gear G has a rearward extending collar or hub within which fits loosely the enlarged end of the feed screw D. The screw is held in place in the hub by a packing ring d.

The feed screw D is operated by a revolving nut H' which is journaled in a bearing J secured to the rear of the bed piece and extending from one side to the other over the rear extension of the headstock C. On the rear end of the nut H' is the gear H by which it is rotated, these two parts being preferably formed in one piece. The inner end of the nut extends through the bearing J and the nut is held in place by collar h.

Power is conveyed to the gears G and H for rotating the spindle and screw by means of the main driving pulleys M which are secured to the end of a shaft L which is journaled in the bearings J and i directly above the screw D. A pinion k on said shaft drives the gear H and a pinion l drives the gear G. Both the pinions k and l are normally loose on the shaft L and are brought into action by the clutches j and l^2 respectively. The clutch l^2 is shown as an ordinary forked clutch, a particular description of which is not necessary. The clutch j is the same except that it extends through the box J as shown in Fig. 6. The clutches l^2 and j are operated by forked levers l^3 and j' which are omitted from Fig. 2 but are shown in Figs. 1 and 7.

The gear H when it takes its motion direct from the pinion k on the main shaft feeds the screw and consequently the headstock, with the rapid motion necessary to a shaping machine. I have provided for a slow feed of the screw for use in screw cutting and other like work requiring a slow feed. In obtaining the slow feed I impart motion to the gear H from a pinion k^2 on the main shaft directly in rear of the pinion k by means of a train of gears t^2, t and pinion t' such as are commonly used on engine lathes. The gear t^2 and pinion t' are made in one piece and are mounted on the end of an arm t^3 which is pivoted to the fixed shaft l' on which the gear t is mounted. The gear t^2 engages the pinion k^2, and the pinion t' engages the gear t which in turn engages the gear H. When the slow feed is not required the arm t^3 is swung back and the gear t^2 disengaged from the pinion k^2. On the front end of the headstock I place a tool block F such as is commonly used in shaping machines and which needs no particular description.

F represents the vertical feed screw and f' is the tool.

The tool block is supported from the end of a supporting bar I which is journaled in the upper part of the bearings i i. This bar is capable of being rotated in its bearings in such a manner as to swing the tool block entirely away from the spindle against the end of which it rests when in its working position. The bearings i may be clamped on the bar I by suitable bolts so that the bar is held rigidly or loosely as required. The tool block is fastened to the front end of the headstock by means of bolts f^4 (Fig. 11) the heads of which enter a dove-tailed slot f^2, the outer edge being secured to the lugs f^3. This groove is concentric with the center of rotation of the bar I so that if the bolts f^4 are loosened and the bar turned the bolts will leave the groove and the tool stock will be released from the sliding headstock C.

On the same end of the bar I as the tool stock is the offset or arm i' having a pin or pivot i^2 used to support the outer end of the tool arbor i, when turned down into the position shown in dotted lines in Fig. 2. 2 represents the milling tool.

In the front part of the machine I provide a revolving table O preferably made square and hollow, the different sides of which are adapted for holding different kinds of work. As herein shown I make two adjacent sides with the ordinary dove-tail grooves running at right angles to each other. On the third side which is the lower side shown in the drawings is a turret P mounted on guides p^2.

p is a bracket for supporting the turret to give the latter sufficient travel away from the headstock. The table O is pivoted to the apron Q which has a cylindrical projection or hub in front which enters the inner end of the table (see Fig. 8) and on which it is adapted to rotate. The table O is secured to the apron Q by means of bolts O′ the inner ends of which are turned at right angles and fit into an annular groove O^2 formed around the outside of the hub. (See Fig. 12.)

The apron Q is supported in horizontal guide q' in the cross slide R in such a manner that it has a horizontal motion with relation to said cross slide which is itself supported in vertical guides q on the front of the stand.

I provide a lateral feed for the apron and table by means of the feed screw r which extends through the apron and is journaled in the ends of the cross slide. On each end of the feed screw is a normally loose gear r' which is capable of being connected or disconnected from the screw by means of clutches r^2.

The cross slide R is raised and lowered by means of a feed screw r^9 stepped in the base of the machine. On the vertical feed screw r^9 is a miter gear r^8 which engages two miter gears r^7, one on each side, each being fixed to the inner end of a shaft r^6. The outer end of each of the shafts r^6 is journaled in the lower portion of the cross slide. On the outer ends of the shaft r^6 are normally loose gears r^4 which are connected with the shaft by means of clutches r^5. Intermediate gears r^{13}, r^3 connect the gears r^4 with the gears r'. Hubs r^{15} are provided on the gears r', r^4 by which the screws r and r^9 may be turned by a wrench and the table fed by hand. The automatic feed of the two feed screws r^9 and r is provided for by a connection with the drawing mechanism at the rear end of the machine. A horizontal shaft S′ is journaled in bearings S^6 S^{16} on the rear of the cross slide R. On its outer end is a gear S^7 which engages with the intermediate gear r^3 (Fig. 3). On its inner end is a miter gear S^2 which engages with a miter gear S^3 connected with a vertical shaft S by means of a spline working in a groove S^5 so that the gear has a vertical movement on the vertical shaft S, (Fig. 9.) A guide S^4 extends from the bearings S^6 over the gear S^3 and holds the latter in contact with the gear S^2.

On the upper end of the vertical shaft S is a miter gear n^4 which engages with a like gear on the end of a horizontal shaft N journaled in bearings n^3 and n on the side of the machine. On the rear end of the shaft N is a set of cone pulleys n' which may be connected by a belt with a set of cone pulleys m, on the independent shaft m'. On this shaft m' is a gear t^6 which engages the pinion k^2 on the main driving shaft. It will thus be seen that the gear t^6 acting through the shafts and gears and pulleys last described drives the feed screw r by which the apron is fed on the cross slide and operates also the screw r^9 which feeds the cross slides vertically. Either feed screw or both may be discontinued by disconnecting the clutches r^2 and r^5.

The feed of the sliding headstock C is reversed as in ordinary shaping machines. On the top of the bed piece B is a guide b^2 (Fig. 1) in which slides a bar b^4 on the rear end of which is a shipper b^5. Two stops b^3 b^3 are secured to the bar b^4 and an arm b^{14} is secured to the headstock between the stops b^3 so that it will strike them in turn as the headstock reciprocates. Both the stops b^3 and the arm are made adjustable as to position so that the headstock may have a long or a short motion.

The cross bar V furnishes a support for the rear ends of the shafts m' and l'.

Having thus described the construction of my machine, its mode of operation will be readily understood. When used as a shaper the tool stock F is in the position shown in Fig. 2, the bar t^3 (Fig. 1) and its connecting gears are swung back and disconnected from the main shaft, the clutch l^2 is disconnected, the clutch j is connected with pinion k, and the clutches r^2 and r^5 are disconnected or connected according to whether a side feed or a vertical feed is desired on the table. The feeding nut H takes its motion from the pinion k being reversed by the shipper in the ordinary manner. For milling and boring the bar I is turned over after loosening the bolts f^4 (Fig. 11) bringing the offset i down and it is then drawn out sufficiently far to allow the tool arbor l to be inserted. One end of the tool arbor is inserted in the conical end of the hollow spindle E and the other is supported by the pivot i^2. The tool arbor is rotated by the pinion l which turns the gear G on the rear end of the spindle E. For drilling, a drill chuck is inserted in the tapering hole in the end of the spindle, the tool arbor being removed.

In using the machine as a turret lathe, the table is revolved so as to bring the turret on top. A suitable chuck is secured to the end of the spindle and operated by the same feed as is used for the shaper. For screw cutting a chuck is fitted in the end of the spindle, and the bar on which the screw is to be cut is inserted into the hollow spindle projecting out over the table. A suitable cutting tool is secured to the table and the spindle and rod are turned by the turning of the spindle as described and fed by the slow motion imparted to the gear H through the train of gears t^2 and t' and t the arm t^3 being thrown over to bring the gear t^2 into engagement with the pinion k^2 (Fig. 1). The outer end of the rod may be supported by the pivot i^2 if desired. The clutch j is thrown over and the pinion k is disconnected. The screw being cut may be cut off or one section may be cut and the bar being pulled out another section cut and so on.

There are many other uses to which the machine can be put which will readily occur to a mechanic in operating it. It is obvious that the tool stock F may be set at any angle and fastened in position by the bolts f^4.

The revolving table may be set at any angle and the shaping tool or the milling tool may be used to cut inclined surfaces.

I claim—

1. In a metal working machine, the combination of a bed piece, a reciprocating head stock held in guides in said bed-piece, a tool block on the forward end of said head stock, a spindle journaled in said head-stock, a milling tool adapted to fit the end of said spindle and a table having its surface parallel with the axis of said spindle, substantially as described.

2. In a metal working machine, the combination of a bed-piece, a reciprocating head stock moving in guides on said bed-piece, a spindle journaled in said head stock, a milling tool adapted to be secured to the end of said spindle, a tool-block secured in guides to the forward end of said head-stock in line with said spindle and adapted to be drawn away from the end of said spindle to permit the use of said milling tool, substantially as described.

3. In a metal working machine, the combination of a bed piece, a reciprocating headstock moving in guides on said bed piece, a tool block removably secured to the forward end of said headstock, a spindle journaled in said headstock, a tool arbor adapted to be secured to the end of said spindle and a support for the outer end of said tool arbor, substantially as described.

4. In a metal working machine the combination of a bed piece, a reciprocating headstock moving in guides on said bed piece, a spindle journaled in the lower part of said headstock, bearings or boxes on top of said headstock, a milling bar journaled in said boxes, a tool block on the forward end of said milling bar and extending down in front of said headstock, an offset or projection on the forward end of said milling bar extending laterally in the opposite direction from said tool block and a tool arbor one end of which is adapted to engage the forward end of said spindle and the other end being adapted to be supported by the said offset or projection.

5. In a metal working machine, the combination of a reciprocating head stock, a tool block on the forward end of said head stock, a spindle journaled in said head stock, a milling tool adapted to fit the end of said spindle and a work table pivoted to the front of the machine and having a plurality of faces parallel with the axis of said spindle, substantially as described.

6. In a metal working machine, the combination of a milling arbor, an apron held in guides below said milling arbor and having a vertical and lateral motion, a table pivoted to said apron and having its faces parallel

with said milling arbor and means for fixing said table in any desired position, substantially as described.

7. In a metal working machine, the combination of a reciprocating head stock, a spindle journaled in said head stock, a milling-tool adapted to fit the end of said spindle and a tool-block and an arm for supporting said spindle pivoted at the end of said head stock, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN A. LIDBACK.

Witnesses:
S. W. BATES,
JAMES T. TODD.