(No Model.)

J. MORGAN.

BOLT OR RIVET MACHINE.

No. 293,348. Patented Feb. 12, 1884.

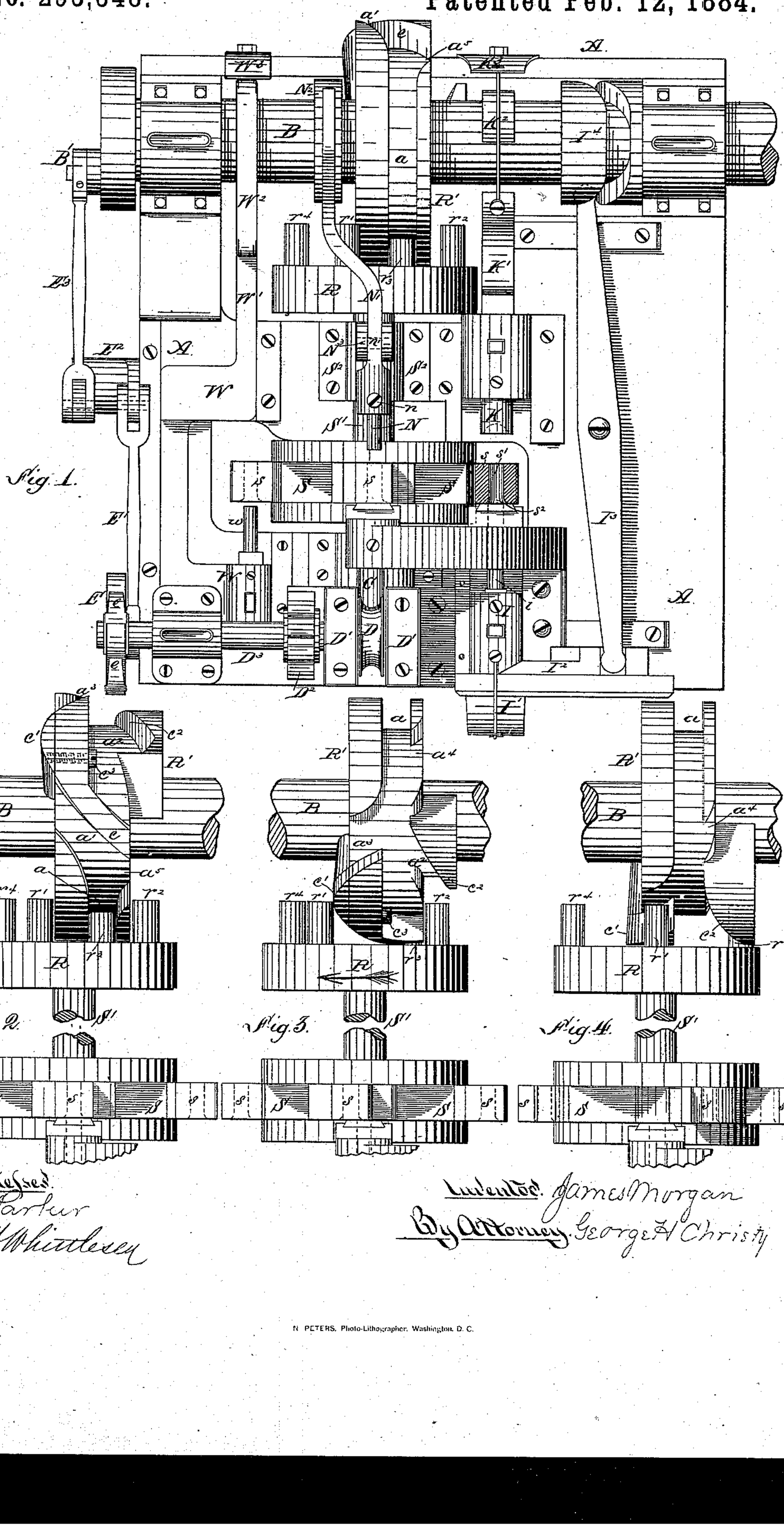

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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BOLT OR RIVET MACHINE.

SPECIFICATION forming part of Letters Patent No. 293,348, dated February 12, 1884.

Application filed May 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, JAMES MORGAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Bolt and Rivet Machines; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a top plan view of my improved machine, and Figs. 2, 3, and 4 are similar views of the die-carrying head and shaft and the mechanism employed for operating the dies.

My present invention relates to certain improvements in that class of bolt and rivet machines for which Letters Patent of the United States were granted to me October 26, 1880, No. 233,685, and July 11, 1882, No. 261,022; and in general terms it consists of certain combinations of a feed-tube forming the stationary member of a shear, one or more dies forming the other member of the shear, and also being operative in forming the bolt or rivet, and mechanism for moving such dies from feeding position in one direction partially across the passage of the feed-tube to partly sever the blank, then entirely across such passage in the opposite direction to complete the severance of the blank, and to hold the dies rigidly in feeding position as against motion in either direction while the feeding is done, as hereinafter more fully described and claimed.

In Fig. 1 of the drawings I have illustrated a general plan of my improved machine, many of the details of which are substantially like the machine shown in Patent No. 261,022, above referred to. In this figure, A represents the main frame. In or near the central line of this frame is journaled a short shaft, S′, by box S^2. On one end of this shaft is secured a radially-mortised head, S, carrying in its mortises dies *s*, having tubular die-cavities *s′* therethrough, one in each die. These dies receive motion from shaft S′, as hereinafter described, whereby they are brought in succession in front of or in line with the feed-tube C, the die-cavities being in such position in line with the tubular passage through C that the rod passed endwise through the tube will also pass through the die-cavity and against a stop, N, also set in the line of feed on the side of the dies opposite the feed-tube.

Before describing the several functions of these several parts, and their several movements by which such functions are performed, I will describe, briefly, other parts of the machine, which are substantially like the corresponding parts in Patent No. 261,022. Among these parts are the feeding, the heading, the discharging, and the stop mechanisms. Feed is imparted automatically by two rolls, D, journaled in uprights or housings D′. The rolls are connected by gearing D^2, so as to take movement together. Intermittent feed or rotary movement is given them by a vibrating arm, E, extending downward from the extended shaft D^3 of one roll, connection being made therewith by an ordinary ratchet-clutch, *e*, or by other suitable clutch mechanism such that vibration of the arm may give the shaft intermittent rotary movement in one direction. From the lower end of arm E a pitman-bar, E′, makes pivot-connection with one arm of a rocking crank, E^2, and from the other arm of this crank a similar pitman-bar, E^3, makes connection with the wrist B′ on the end of driving-shaft B, whereby continuous rotary motion of the driving-shaft gives reciprocating motion to the pitman-bars, vibrating arm E, and giving feed-motion to the rolls, as stated. The stop N, which arrests forward feed of the rod, thereby securing uniform lengths of blanks, is adjustably secured in the end of its supporting-bar N′ by screw *n*, whereby the stop may be set for different lengths of blanks.

In order to move the stop out of contact with the end of the blank preliminary to moving the dies, the bar N is pivoted to a standard, N^3, as at *n′*, and its outer end rests upon a cam, N^2, secured on the driving-shaft, so that each rotation of the shaft and cam lifts the outer end of the bar and dips or depresses the stop. The header K is placed on the right-hand side of the bed, its distance from the feed-tube C being equal to the distance between successive dies *s*, or being some multiple thereof, so that when one die is in feeding position to receive a blank, another die may be in position to be operated on by the header. This header

K is of the usual form, and is moved horizontally toward and from the die by a spring, K^3, and by a cam or wiper, K^2, on the driving-shaft, which cam bears against the enlarged end of stem K′, the movement thus imparted being operative in upsetting the end of the blank protruding from the adjacent end of the die. The blank is supported as against the pressure of the header by an anvil-punch, *i*, carried by sliding block I. The punch is withdrawn by a spring, I′, and is pressed forward into the flaring or bell-mouthed end s^2 of the die-cavity by a sliding wedge, I^2, actuated by pivoted lever I^3 and cam I^4. This movement of the punch is designed to move the blank endwise in the die-cavity, carrying its end out of the flaring portion s^2, which latter feature is provided to facilitate entry of the rod into the cavity in feeding. The punch is held against the end of the blank by the wedge I^2 until the header has completed its work, when both the header and punch are withdrawn by their respective springs, K^3 and I′.

On the left-hand side of the frame, corresponding to one position of rest of the dies, is mounted a discharging-punch, *w*. This punch is carried in horizontal reciprocating movement into and out of the die-cavites to discharge the article therefrom by a sliding plate or frame, W, which is secured by suitable guides on the bed of the frame, and is actuated by a spring, W^3, and by a cam on the driving-shaft pressing upon a head or yoke, W^2, which latter is connected by stem W′ to the frame or plate W.

In the operation of the machine the feeding, heading, and discharging operations are performed simultaneously, or nearly so, while the dies are at rest. It is of great importance in this connection that while these operations are being performed the dies should be held firmly in position as against movement either forward or backward, in order that the several parts of the machine may operate properly in connection with the dies; also, that in shearing the cut should be made in part from each side, front, and back, in order to avoid fins on the edge of the rod and blank. This is of special importance, not only to prevent obstruction to proper entry of the rod into the die-cavities in feeding, but also to prevent bending the end of the blank when pressed against the stop N. If a projecting edge is made on one side by an inclined cut across the rod in one direction, there is a decided tendency therein to bend or be deflected out of the true line of feed under endwise pressure between the stop and the feed-rolls, the rod being heated and very pliable. If the protruding end of the blank is thus bent, a one-sided head is formed in the heading operation; also in such heading operation on a bent blank there is a marked tendency to move the dies usually backward, depending upon the direction of bend, and this backward or moving pressure upon the dies interferes more or less with the feeding operation, not only by pressure and friction upon the moving rod, but also by tending to bend it, thereby increasing the trouble, caused in the first instance by an improper cut in shearing the blank from the rod. These difficulties are obviated in my present invention by shearing the blank from the rod, as in my prior patent, No. 261,022, by first moving the die backward partially—say half-way—across the feed-passage, thereby making a cut into the rod from one side, and then moving the die entirely across the feed-passage in the opposite direction to completely sever the blank; and, in addition to this, I make provision for holding the dies rigidly and firmly against movement in either direction while the feeding is done and while the heading and discharging is done, so that not only is easy feed and a straight blank secured, but also perfect, full-sided, and well-shaped heads, this latter feature being secured not alone by the straight form of blank, but also by preventing movement of the dies under the force applied in heading. In securing these several advantageous results, I make use of a disk or wheel, R, secured on the outer end of shaft S′, such wheel having on its outer side face a series of pins or studs, r' r^2 r^3 r^4, set at uniform intervals in circular order around the axial center. These pins work in cam-grooves formed on the periphery of a wheel, R′, secured on driving-shaft B. About one-half the circumference of this wheel R′ is occupied by a groove, *a*, straight or parallel with the plane of the wheel within which some one of the pins (r^3, as shown) is held while the feeding, heading, and discharging operations are performed. As this groove *a* is in and parallel with the plane of rotation of the wheel, rotary motion of shaft S′ will be effectually prevented so long as one of the pins is in the groove. The remaining part of the periphery of wheel R′ is occupied by cams and grooves inclined across its peripheral face, designed to act upon and give rotary movement to the pins and to the shaft carrying the dies. These inclined cams and grooves consist of an inclined groove, *a*′, crossing the face of the wheel at or leading to one side—the left side—from one end of the straight groove *a*. A correspondingly-inclined cam, *c*, forming one wall of groove *a*, also crosses the face of the wheel in the same direction, and is extended somewhat on the left-hand side by a curved piece, *c*′, secured thereto by screw c^3; also, a cam; c^2, is extended to the right-hand side, parallel, or nearly so, with cam *c*, and separated therefrom by an inclined groove, a^2, leading from the right-hand side of the wheel, past the cam c^2, to the plane or line of straight groove *a;* also, an inclined groove, a^3, leads from the left-hand side across the ends of grooves *a* a^2, emerging on the right-hand side, as at a^4.

In operation a pin directly below the axis, as pin r^3, takes the groove *a* until in the rotation of wheel R′ such pin enters the groove

a', when it crosses the face of the wheel through the latter groove, while other pins above the axis cross in opposite direction through the groove a^3 a^4.

In Figs. 1 and 2 I have shown the pin r^3 below the axis of S′ entered in the straight groove a, the wheel R′ being turned a little farther in Fig. 2 than in Fig. 1, for the purpose of showing better the inclined cams and grooves which first act upon the pins.

In the order of operation the side extension, c', of cam c first acts upon or presses the inner side of pin r' (above the axis S′) just as pin r^3 (below the axis) emerges from groove a. This pressure of cam c' moves the pin and its shaft back from right to left, thus giving the back movement of the dies partially across the feed-passage to partly sever the blank. In order to clear the pin r^3 for this movement, the side wall between groove a and cam c is cut away, as at a^5, so that pin r^3 may enter this recess or cut in the wall as it is moved backward. This back movement is comparatively small, by preference such as to move the dies about half-way across the feed-passage. Its extent may be varied to advantage with rods of different size, and for this purpose the cam-piece c' is made removable by the screw attachment c^3, above described, so that interchange may be made with other parts or pieces of different degree of lift or curve. As the pin r' turns the rounded face of cam c', the pin r^3 below is pressed by the inclined cam c, (see Fig. 3,) thereby moving the wheel R in the direction indicated by the arrow, carrying the die entirely across the feed-passage toward the header, thus completing the shearing operation.

Owing to the limited width of space available between the pins r' r^2, &c., for the wheel R′, I prefer to complete the forward movement of the dies—amounting in the present instance to a quarter-rotation plus the amount of back movement at first given—by engagement of cam c^2 upon pin r^2, which is moved into position therefor as the pin r^3 approaches or reaches the swell of cam c'. This cam c^2 is in effect a continuation of cam c, though detached therefrom, so as to be operative upon another pin, and by its pressure upon such pin it continues and completes the desired forward movement of the dies, carrying one to the header and moving another into feeding position. As the cam c acts upon pin r^3, the pin r', which has turned the swell of cam c', takes into the groove a^3, (see Fig. 4,) and, crossing the face of the wheel, emerges from groove a^4 on the right-hand side of the wheel. The pin r^2, under pressure of cam c^2, is carried to the central plane of the wheel in position to take the straight groove a when the die movements are complete, and thereby hold them firmly against either forward or backward movement while the feeding, heading, and discharging operations are being performed.

Upon completion of the set of movements above described the pin r' will be on the right, having emerged from groove a^3 a^4, the pin r^2 will be in the central plane of the wheel, having emerged from groove a^2, the pin r^3 will be on the left, having emerged from groove a, and pin r^4, which was not used in the preceding movement, is brought into position to engage cam c' and to perform the same functions in the next set of operations as were performed by pin r' in the preceding set, so that in such second or succeeding operation the pins operated on will be first r^4 by cam c', second r^2 by cams c c' combined, and third r' by cam c^2.

The number of pins provided on the wheel R may be increased or diminished, depending upon the number of dies carried by shaft S′ and the fractional part of a rotation which is to be given at each operation, and such variations in number I consider as coming within my invention. I prefer, however, to use four dies and four pins, and to give the die-carrying shaft a quarter-rotation at each step plus the amount of back movement at first given for shearing.

I claim herein as my invention—

1. In a bolt and rivet machine, the combination of feed-tube C, dies s, in any desired number, such dies being movable backward to partially sever the blank, and then forward to completely sever the blank, and a device, substantially as described, which gives such backward and forward movements to the dies and holds them in positions of rest thereafter against movement in either direction.

2. The die-carrying shaft S′, in combination with wheel R, having pins projecting from its side face, and wheel R′, having cams and grooves on its periphery engaging with the pins on wheel R, substantially as and for the purposes set forth.

3. The combination of a die-carrying shaft, a wheel secured thereon having pins projecting from its side face, and a wheel having on a part of its periphery-face a groove parallel with the plane of the wheel, and on the remaining part of such periphery having inclined cams and grooves, substantially as set forth.

4. The combination of die-carrying shaft S′, wheel R, having pins projecting from its side face, driving-shaft B, and wheel R′, the latter having on its periphery-face straight groove a, inclined grooves a' a^2 a^3 a^4, and inclined cams c c' c^2, substantially as and for the purposes set forth.

5. The combination of die-carrying shaft S′, disk or wheel R, having four pins, r' r^2 r^3 r^4, on its side face set in circular order about the axis of the shaft, and wheel R′, having on its periphery-face straight groove a, inclined grooves a' a^2 a^3 a^4, and inclined cams c c' c^2, substantially as and for the purposes set forth.

6. The combination of feed-tube C, stop N, dies s s, heading mechanism K i, and mechanism, substantially as described, for moving

the dies both backward and forward to sever the blank and carry the dies in succession from the feeding to the heading positions, and for holding the dies during the feeding and heading operations from movement either forward or backward, as set forth.

7. The wheel R′, having straight groove *a*, inclined grooves a', a^2, a^3, and a^4, and inclined cams c c^2, in combination with removable cam-piece c', substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand.

JAMES MORGAN.

Witnesses:
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