2 Sheets--Sheet 1.

M. BRAY.

Machine for Drilling Rivets.

No. 166,963. Patented Aug. 24, 1875.

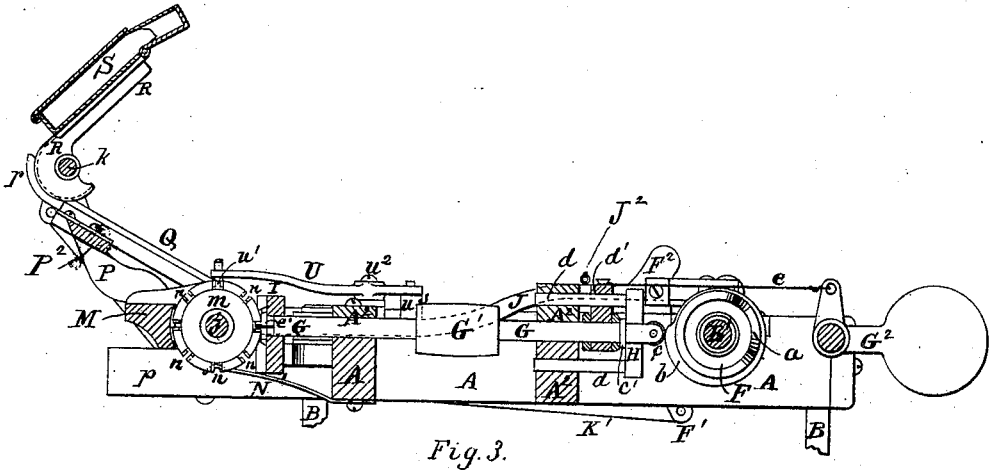

Fig. 3.

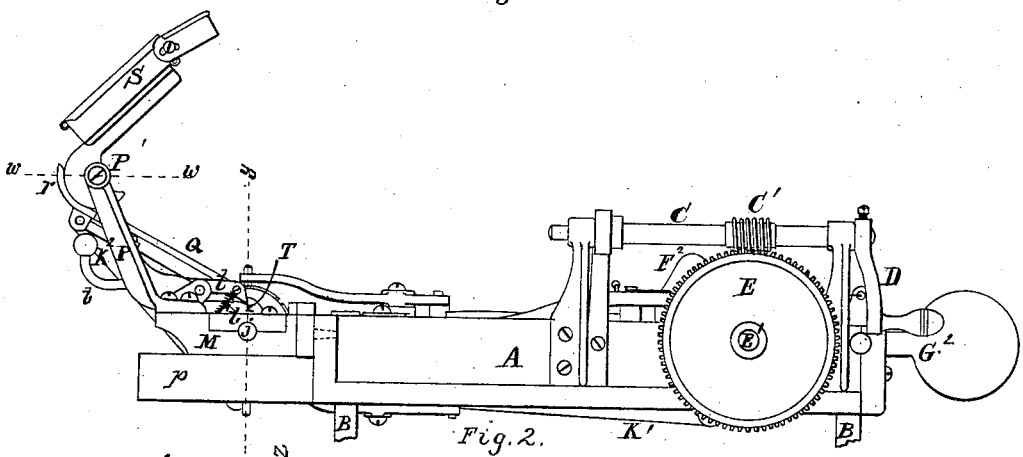

Fig. 2.

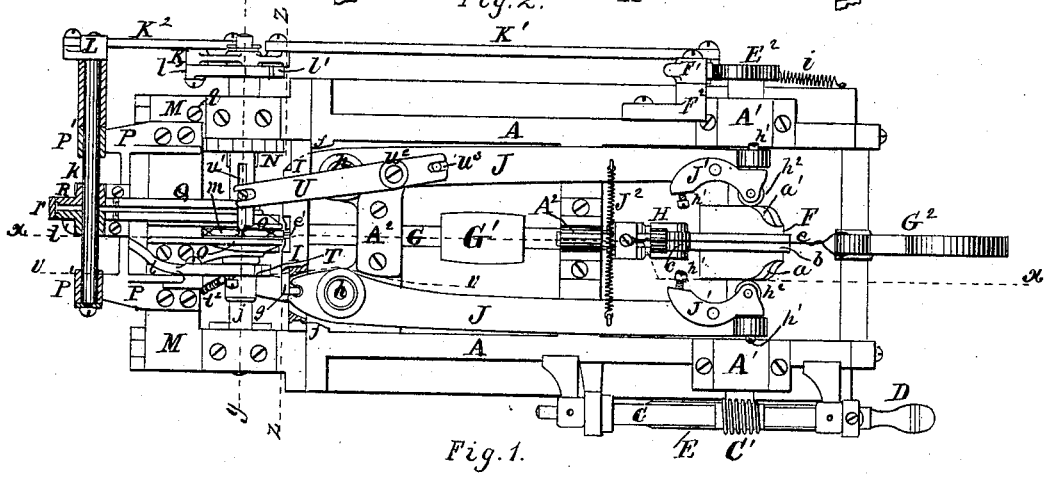

Fig. 1.

Witnesses.

Wm. P. Edwards

E. A. Hemmenway.

Inventor.

Melleu Bray

2 Sheets--Sheet 2.

M. BRAY.

Machine for Drilling Rivets.

No. 166,963. Patented Aug. 24, 1875.

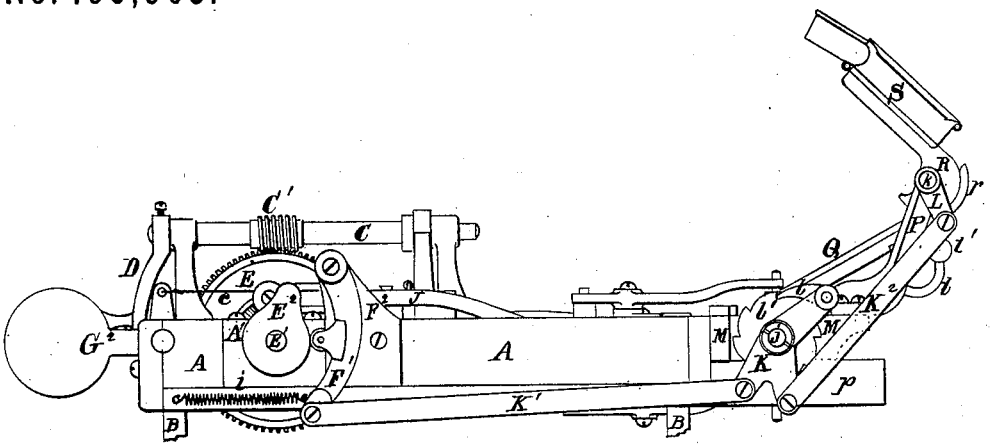

Fig. 4.

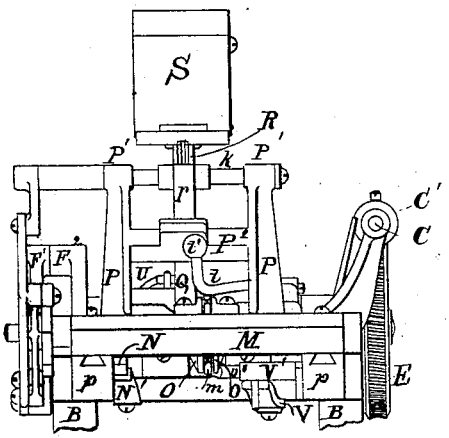

Fig. 5.

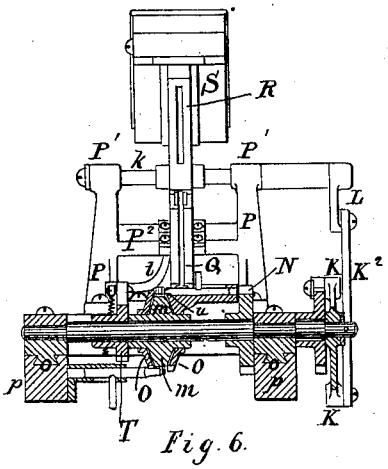

Fig. 6.

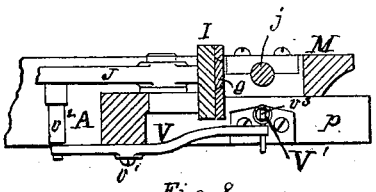

Fig. 8.

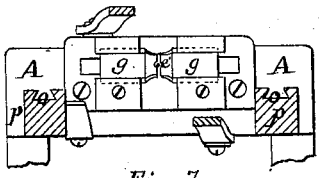

Fig. 7.

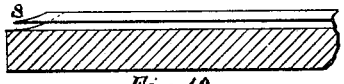

Fig. 10.

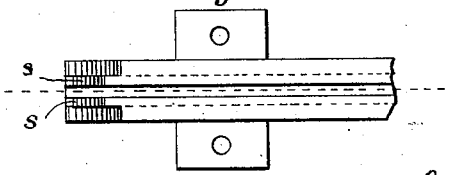

Fig. 9.

Witnesses.

Wm. C. Edwards

E. A. Hemmenway.

Inventor.

Milton Bray

UNITED STATES PATENT OFFICE.

MELLEN BRAY, OF NEWTON, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR DRILLING RIVETS.

Specification forming part of Letters Patent No. **166,963**, dated August 24, 1875; application filed June 11, 1875.

To all whom it may concern:

Be it known that I, MELLEN BRAY, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Drilling-Machines for Forming the Hollow Shanks of Tubular Rivets, of which the following, taken in connection with the accompanying drawings, is a specification:

My invention relates to a machine for drilling out the body or shank of a rivet after the rivet has been formed by a previous operation, so as to make said shank a thin hollow tube, capable of being clenched upon the material in which it is set by turning the end of said tubular shank over onto the material in the same manner that eyelets are set; and it consists, first, in the combination, with a drill arranged to be revolved at a suitable speed, and automatically moved endwise, for the purpose of feeding it to its work and withdrawing it again when its work is completed, of a hopper, into which the solid rivets are placed in bulk, and from which they are discharged in regular order, with their heads all in one direction; an inclined chute, down which the rivets slide; and a pair of clamping-dies, arranged to seize the rivet, and hold it in proper position to be acted upon by the drill, and release it again when the drilling is completed.

My invention further consists in a peculiar construction of the inclined chute and the hopper, whereby rivets or eyelets may be discharged from the hopper with their heads upward, and be delivered to the carrier-wheel with their heads downward, as will be more fully described.

My invention further consists in the use, in combination, with an automatically-operated drill, a hopper, and an inclined chute, of a carrier wheel or disk, having a series of pockets in its periphery, each adapted to receive a rivet with its head toward the axis of said wheel or disk, and arranged to be intermittently rotated, so as to present the rivets contained in said pockets successively to the grasp of the clamping-dies, and to the action of the drill.

My invention further consists in the combination of an intermittently-rotating wheel or disk, provided with a series of pockets, of suitable size and form to receive a rivet cut through its periphery, and a pair of stationary or fixed shields placed one upon either side of said intermittently-rotating carrier-disk, so formed and arranged as to close up the sides of the pockets in said disk between the point where the rivet is fed into the disk and the point where it is discharged, except at the point where the rivet is seized and held by the clamping-dies, while the rivet is being drilled.

My invention further consists in the combination, with an intermittently-rotating carrier-wheel, provided with pockets in its periphery to receive and carry in succession a series of rivets to a position in front of the drill, and an inclined chute, down which said rivets slide in a single line with their heads all in one direction, of a reciprocating plunger arranged to move in a suitable channel-way, and feed the rivets successively from the foot of the inclined chute into the pockets in the carrier-wheel.

My invention further consists in the use, in combination with an intermittently-rotating carrier-wheel, provided with a series of pockets in its periphery, each adapted to receive and carry a rivet to the drilling-tool, and a pair of fixed or stationary shields placed one upon either side of said intermittently-rotating carrier-wheel, of a reciprocating plunger, adapted to discharge the drilled rivet from said carrier-wheel at a given and fixed point.

My invention further consists in mounting the intermittently-rotating carrier-wheel and other rivet separating and feeding devices upon a supplementary frame, fitted by suitable slides to the main frame, in such a manner that, while it may be firmly secured in position while the machine is in operation, it may be readily moved from said position for the purpose of making the clamping-dies and drill conveniently accessible for repairs and adjustment.

My invention further consists in the use, in combination with an intermittently-rotating carrier-wheel or disk, provided with a series of pockets in its periphery, each adapted to receive a rivet and convey it to the drilling-tool, a pair of clamping-dies, and an automatically-operated drill, of a detent-wheel,

having formed in its periphery as many notches or detents as there are pockets in the carrier-wheel, and mounted upon the shaft of said carrier-wheel, and a detent spring or lever provided with a suitable projecting V-shaped point or tooth to fit said detent-notches, all arranged and adapted to correct any inaccuracies in the movements of the carrier-wheel, and hold it in the proper position while the rivet is being drilled.

My invention further consists in the use of a hammer operated by a cam having a series of lifting points or teeth, and arranged to strike the inclined chute at each vibration of the hopper, for the purpose of insuring the descent of the rivets along said inclined chute to a position in front of the plunger which feeds them into the carrier-wheel.

My invention further consists in the use, in combination with an automatically-operated drill, of a train of mechanism for holding the rivet while it is being drilled, consisting essentially of a pair of reciprocating clamping-dies, a pair of vibrating levers, each connected at one end to one of said clamping-dies, and provided at the other end with an anti-friction truck; a double cylinder-cam placed between said levers and arranged to operate both of said levers at the same time, to close the clamping-dies upon the rivet to be drilled; and a spring for opening said dies again after the drilling is completed.

My invention further consists in mounting said anti-friction trucks, upon which the cam or cams act to operate the clamping-levers in saddles or frames pivoted to the long arms of said levers, in such a manner that said trucks may be adjusted toward or from each other, for the purpose of regulating the pressure of the clamping-dies upon the rivet, and to compensate for the wear of the parts.

Figure 1 of the drawings is a sectional plan of a machine embodying my invention, the cutting-plane being on line *w w* on Fig. 2. Fig. 2 is a side elevation. Fig. 3 is a longitudinal section on line *x x* on Fig. 1. Fig. 4 is an elevation of the side opposite to that shown in Fig. 2. Fig. 5 is a front-end elevation. Fig. 6 is a transverse section on line *y y*, Fig. 1, looking toward the hopper. Fig. 7 is a transverse section of the main frame on line *z z*, Fig. 1, looking toward the cam-shaft, with the supplementary frame and the rivet-feeding mechanism removed. Fig. 8 is a partial section on line *v v* on Fig. 1, looking toward the nearest frame, and showing the manner of operating the discharge-plunger. Figs. 9 and 10 are, respectively, a plan and a longitudinal section, enlarged, of the stationary or fixed inclined chute.

In all the drawings, A is the main frame of the machine mounted upon suitable legs B, but a small portion of which are shown. C is the driving-shaft operated by a belt and pulley, (not shown in the drawings, but to take the place of the crank D,) and provided with the screw or worm C′, which meshes into and acts upon the worm-wheel E secured to the outer end of the cam-shaft E^1, which is mounted in the bearings A^1 A^1 on the frame A, and has mounted thereon, in the center between said bearings, a cylinder, F, having formed thereon the two edge-cams *a* and *a′* and the central face-cam *b*, all constructed in one piece, or they may be made separately, and secured to the shaft side by side, if desired. G is a drill-spindle mounted in bearings A^2 A^2 of the frame A in such a manner that it may be revolved and moved endwise therein at the same time, and provided with the pulley G^1, by means of which and a belt (not shown) rotary motion is imparted thereto. H is a yoke arranged to bear against the rear end of the spindle G, and provided with a truck, *c*, against which the face-cam *b* acts to force the spindle H endwise toward the object to be drilled, said yoke being prevented from revolving with the spindle by the rods *d d*, which pass through holes formed for the purpose in the bearing A^2. The rear end of the spindle G is provided with a collar, *c′*, between which and the bearing A^2 the spindle G is embraced by the arm *d′*, which extends upward therefrom, in which position it is retained by the rod *d* passing through it. To the upper end of this arm is attached one end of a wire or rod, *e*, the opposite end of which is secured to the vertical or upright arm of the weighted lever G^2, by means of which the spindle G is kept in bearing contact with the yoke H, and the truck *c* carried thereby in bearing contact with the cam *b*.

In the forward end of the spindle G is set a drill, *e′*, of suitable size, and adjusted to the proper length to drill the rivet to the required depth when the cam *b* has forced the spindle G to the extreme of its forward motion. I is a die-plate, bolted to ears *f f*, projecting inward from the side bars of the frame A, upon the front face of which are fitted, to slide in suitable dovetailed bearings formed for the purpose, two clamping-dies, *g g*, one upon either side of the drill *e′*. The inner ends of these dies are made curved to the arc of a circle equal to the diameter of the shank of the rivet to be drilled, so that when they are closed upon the rivet they will nearly surround its shank in an obvious manner. The outer ends of these dies are each provided with an ear, projecting from its back face and fitting into a fork formed in the end of the lever J, by means of which the dies *g g* are made to partake of the motion of said levers, an opening being made through the plate I for the passage of each of the levers J. The levers J are pivoted at *h h* to the frame A, and extend horizontally, or nearly so, toward the rear, as shown, and have pivoted to their rear ends the saddles or frames J^1, held in position and adjusted thereon by the set-screws h^1 h^1, and having mounted therein the trucks h^2 h^2, which bear against, and are acted upon by, the cams *a* and *a′*, to force the rear ends of said levers apart, and thereby cause the dies *g g* to ap-

proach each other and clamp the rivet. J^2 is a spring, each end of which is attached to one of the levers J, the tension of which serves to keep the trucks h^2 h^2 always in contact with the cams a and a'. The cam-shaft E^1 has secured to its outer end, opposite to the worm-wheel E, a cam, E^2, arranged to impart a vibratory motion to the lever F^1, which is pivoted to the stand F^2, secured to the side of the main frame A, and is held in contact with the cam by the spring i. The lever F^1 is connected to the three-armed lever K, mounted loosely on the end of the shaft j, by the rod K^1, and the lever K is connected, by the link K^2, to the lever or arm L, secured firmly to the end of the rocker-shaft k. The upper end of the lever K has pivoted thereto the pawl l, which engages with teeth formed in the periphery of the wheel l', secured firmly to the shaft j, the form of the cam E^2 and the arrangement of the levers F^1, K, and L, links or rods K^1 and K^2, the pawl l, and ratchet-wheel l' being such that each revolution of the cam-shaft will impart an intermittent rotary motion to the shaft j, and an intermittent vibratory motion to the shaft k. The shaft j is mounted in suitable bearings in the supplementary frame M, and has secured thereon in the center, between the two side frames, and directly in front of the drill e, the carrier-wheel or disk m, the outer edge of which is made of a thickness about equal to the diameter of the rivet to be drilled, and has cut through said thin portion a series of slots or pockets, n, of a shape corresponding to the rivet, as seen in elevation, said pockets being equidistant, and so formed as to receive the rivet with the head toward the axis of the wheel, as shown in Fig. 3.

The shaft j also has secured thereto the wheel or disk N, having formed in its periphery a series of detent-notches equal in number to the pockets n in the carrier-wheel m, and into one of which snaps the V-shaped point or end of the detent-spring N′ at the completion of each motion of the carrier-wheel m, and serves to correct any irregularity in the motion of said carrier-wheel, and to hold it in place till the clamping-dies have closed upon the rivet. O and O are two annular rings attached by suitable feet to the frame M, one upon either side of, and close to, the carrier-wheel m, and covering the sides of the pockets n, except where the rivet is fed into, and discharged from, said wheel, and where the clamping-dies seize and hold the rivet while it is being drilled. The frame M is fitted to dovetailed slides o o, formed upon the upper side of arms p p projecting from the frame A, and is held in proper position by the pin or bolt q passing vertically through the frame M and arm p. P is a bifurcated stand secured to and rising from the frame M, and terminating at its upper end in two boxes, P^1, in which is mounted the rocker-shaft k. The two portions of the stand P are connected together by the tie P^2, to which is secured the upper end of the inclined chute Q, the lower end of which rests upon, and is secured to, a projection upon one of the shields O and has formed in its upper side an inverted T-shaped groove. The tie P^2 also has secured to it above and in line with the chute Q a curved shield, r, arranged so that its curved surface is concentric with the axis of the shaft k, and fits closely against the curved edge of the chute R mounted upon the shaft k, so as to vibrate therewith. The chute R has formed in its upper side a T-shaped groove extending around its curved or disk-shaped end in such a manner that a rivet will slide along said groove with its head upward and pass around said curved end with its head between the chute and the curved shield r. The chute Q has formed upon its upper end two clearer, points, s s, one upon either side of the narrow portion of the inverted T-shaped groove, and so formed and arranged as to fit into the wide portion of the T-shaped groove in the vibrating chute R in such a manner that their points shall take over the heads of the rivets and compel them to pass down the chute Q instead of following the curve of the rounded end of the chute R and passing out above the chute Q. These clearer-points s s are clearly shown at an enlarged scale in Figs. 9 and 10. S is a hopper, secured to the upper side of the chute R, and having a suitable slot cut through a portion of its bottom for the shank of the rivet to fall into, and a suitable opening for the passage of the head through the lower end wall thereof, said hopper being constructed substantially as described in Letters Patent No. 161,659, granted to me April 6, 1875, and, therefore, forms no part of my present invention.

T is a face-cam, secured to the shaft j, and provided with as many lifter-toes or separate cam-throws as there are pockets in the wheel m, said lifter-toes acting upon the short arm of a lever, t, to the long arm of which is attached the hammer-head t^1, all so arranged that at every movement of the carrier-wheel to bring a rivet into position to be drilled one of said lifter-toes, acting upon the short arm of the lever t, will cause the hammer t^1 to be depressed, and, as the lifter-toe passes from under the end of the lever t, the spring t^2 will cause the hammer t^1 to strike a smart blow upon the under side of the tie P^2, and thus jar the inclined chute Q and cause the rivets contained therein to descend along said chute till the lower rivet drops into the channel u in front of the plunger u^1, by which it is fed into one of the pockets n in the carrier-wheel m. U is a lever, pivoted to the frame A at u^2, and connected at its front end to the plunger u^1, and at its rear end to the stud u^3, set in the upper side of one of the levers J, through which motion is imparted thereto and to the plunger u^1 to feed the rivet into the carrier-wheel m, the forward motion of said lever taking place at the same time that the clamping-dies close upon the rivet in front of the

drill, and, of course, when the carrier-wheel is in a state of rest. V is a lever, pivoted at v^1 to the frame A, and connected at its rear end to the stud v^2, set in the under side of one of the levers J, and at its front end to the plunger v^3, fitted to reciprocate in the stand V′, and to discharge the rivet from the carrier-wheel *m*.

What I claim as new, and desire to secure by Letters Patent of the United States, is as follows:

1. In combination with an automatically-operated drill, a hopper, into which solid rivets may be placed in bulk, and from which they are discharged in regular order with their heads all in one direction, an inclined chute, down which the rivets slide to the drilling-tools, and a pair of clamping-dies, arranged to seize the rivet, hold it while it is being drilled, and release it again when the drilling is completed, substantially as described.

2. In an apparatus for separating rivets, the combination of the fixed inclined chute Q, the curved shield *r*, the vibratory chute R, having a semicircular end concentric with the axis about which it vibrates, and with the curved shield *r*, and a hopper attached to, and arranged to vibrate with, the chute R, substantially as described.

3. In combination with an automatically-operated drill, a hopper for separating the rivets, and an inclined chute leading therefrom, an intermittently-rotating wheel or disk, provided with a series of pockets in its periphery, each adapted to receive a rivet from the chute and convey it into position to be drilled, substantially as described.

4. The combination of the carrier-wheel *m* and a pair of annular shields, O O, all constructed, arranged, and operating as and for the purposes described.

5. The combination of the inclined chute Q, carrier-wheel *m*, a pair of annular shields, O O, and the reciprocating plunger u^1, all constructed, arranged, and operating as and for the purpose described.

6. The combination of an intermittently-rotating carrier-wheel, provided with a series of pockets in its periphery, a pair of fixed or stationary shields, placed one upon either side of the said carrier-wheel, and a reciprocating plunger, arranged to discharge the drilled rivet from the carrier-wheel, substantially as described.

7. In combination with an automatically-operated drill and a pair of clamping-dies mounted upon the main frame A, the supplementary movable frame M, having mounted thereon the rivet separating and feeding devices, substantially as and for the purposes described.

8. In combination with an automatically-operated drill, a pair of clamping-dies, and an intermittently-rotated carrier-wheel, having a series of pockets in its periphery, the detent-wheel N and detent spring or lever N′, arranged to operate substantially as described.

9. In combination with a hopper for separating rivets and an inclined chute leading therefrom, the lever *t*, provided with the hammer-head t^1, the cam T, provided with a series of lifter-toes, and the spring t^2, all arranged to operate as and for the purposes described.

10. The combination, with an automatically-operated drill, of a pair of movable clamping-dies, *g g*, a pair of vibrating levers, J J, and the two edge cylinder-cams *a* and *a′*, all arranged and operating substantially as described.

11. The saddles or frames J′, pivoted to the levers J J, and adjustable thereon by means of the set-screws h^1 h^1, and having mounted therein the trucks h^2 h^2, all as and for the purposes described.

Executed at Boston this 8th day of June, 1875.

MELLEN BRAY.

Witnesses:
WM. P. EDWARDS,
E. A. HEMMENWAY.