

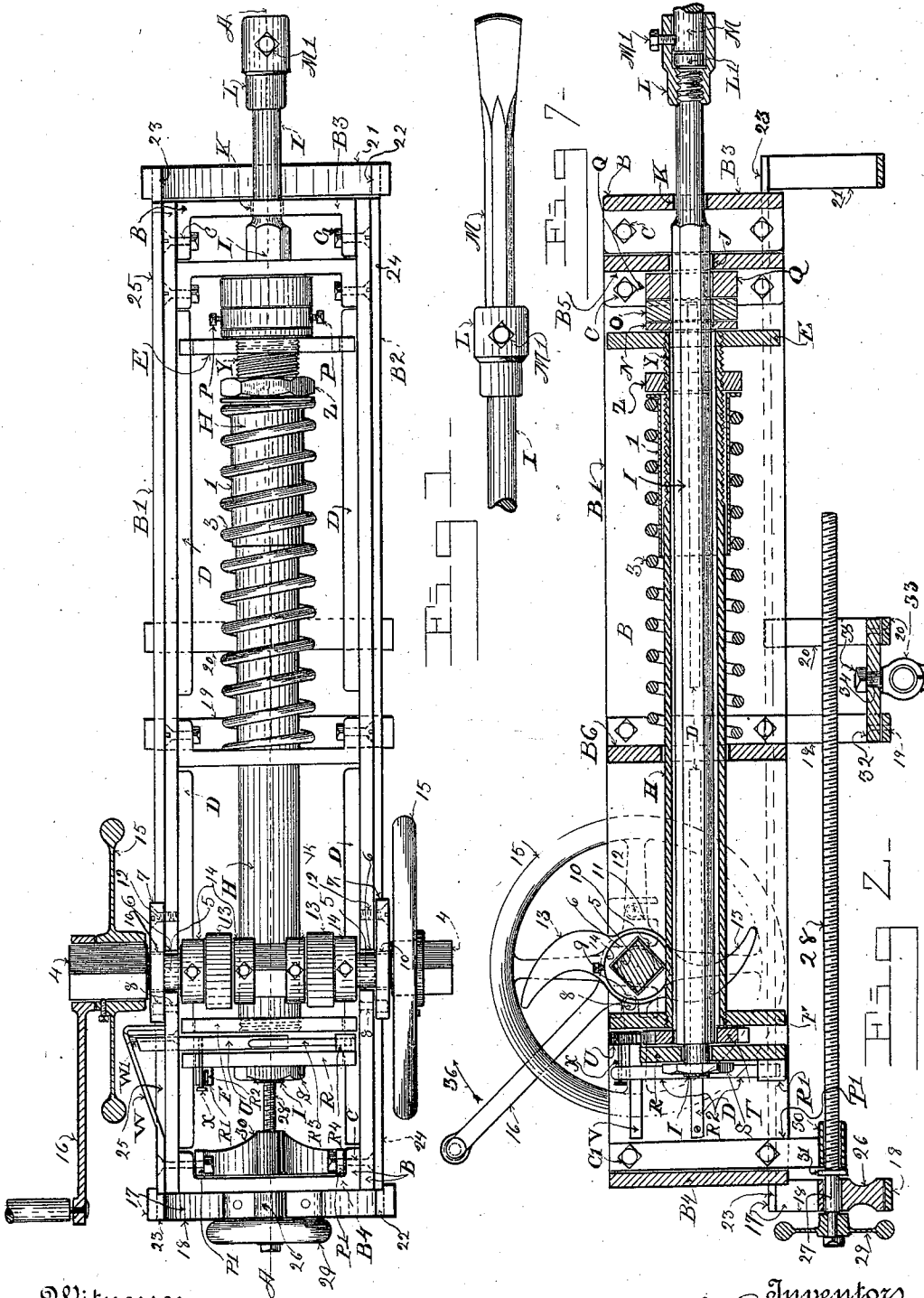
(No Model.)

2 Sheets—Sheet 1.

F. & W. F. CRAMER.
ROCK DRILL.

No. 576,660.

Patented Feb. 9, 1897.



Witnesses

Alfred N. Parnall
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Inventors
Frederick Cramer
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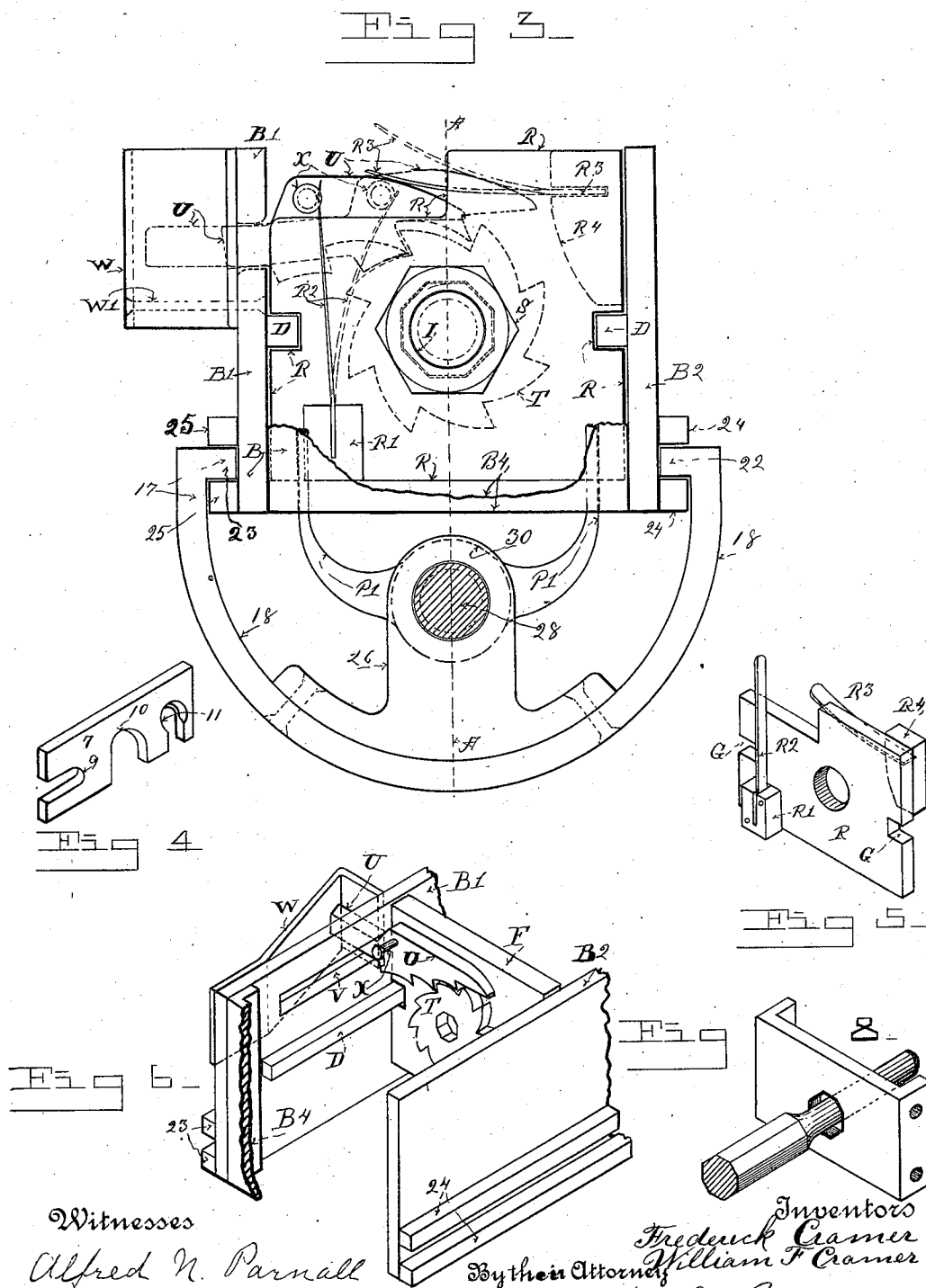
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UNITED STATES PATENT OFFICE.

FREDERICK CRAMER AND WILLIAM F. CRAMER, OF DENVER, COLORADO.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 576,660, dated February 9, 1897.

Application filed May 9, 1896. Serial No. 590,908. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK CRAMER and WILLIAM F. CRAMER, citizens of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Rock-Drills; and we do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

Our invention relates to improvements in rock-drilling machines, and particularly to that class of rock-drills operating by hand; and the objects of our invention are, first, to provide a rock-drill in which the drill-supporting bar and the cutting-drill are locked against rotative movement in either direction just before and during the striking of the cutting-drill against the rock, thereby preventing any torsional twist and backlash of the supporting-bar and rotary-feeding ratchet-wheel against its pawl; second, to provide an improved ratchet-and-pawl drill-rotating mechanism which will obviate the breaking of the teeth of the ratchet-wheel and the pawl; third, to provide means for adjusting the tension of the drill-actuating spring, and consequently the force of the blow; fourth, to provide means for cushioning the force of the stroke of the drill-supporting bar when the drill fails to strike the rock or strikes into an open seam; fifth, to provide a light, compact, durable, simple, and inexpensive hand rock-drill. We attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a plan view of our improved rock-drill. Fig. 2 represents a longitudinal sectional view of the same on line A A of Fig. 1. Fig. 3 represents a full-size end elevation looking toward the cutting end of the drill with the end of the frame broken away. Fig. 4 represents a perspective view of the shaft-cap. Fig. 5 represents a perspective of the ratchet-plate. Fig. 6 represents a fragment of the rear end of the ma-

chine. Fig. 7 represents a fragment of the drill-bar with its chuck and a cutting-drill. Fig. 8 represents a perspective view of the buffer-plate and a fragment of the drill-bar in engagement therewith.

Similar letters and figures of reference refer to similar parts throughout the several views.

Referring to Figs. 1 and 2, B designates the sliding carriage of the machine. It is preferably constructed of steel. It comprises the sides B' and B², the ends B³ and B⁴, which are provided with angled edges which bolt to the sides by bolts C, and the intermediate pieces B⁵ and B⁶, which are formed and bolted to the sides similar to the ends of the two. B⁵ forms a lock-plate for the drill-bar and also a buffer-plate for the spent blows of the machine. To the inner surface of the side pieces and opposite one another we secure guideways D, which are arranged centrally of the width of the sides. We arrange the ways on either side of the central cross-piece B⁶ and in line with one another. Two cross-heads E and F, which consist of rectangular blocks, are adapted to slide on these ways by means of notches G. The cross-heads are positioned a short distance from the ends of the frame and are joined together by a piece of tubing H, which is threaded to them. This tube H freely incloses the drill-bar I and makes, with said cross-heads, a sliding carriage upon said ways and within the said slidable carriage B.

The drill-bar I is preferably an octagon bar of steel. It extends beyond the tube at both ends. At its chuck end it extends through an octagon hole J, made in the buffer-plate B⁵, which it fits freely, but which locks it against rotary movement when the drill-bar is in its normal position. The end of the drill-bar is turned round and is supported in a round hole K in the front end piece B³ of the frame. The extreme end is threaded to a chuck L, which has a larger hole drilled in it from the front end to receive the shank of the cutting-drill M, a fragment of which is shown in the chuck in Fig. 2. Between the end of the drill and bottom of its hole in the chuck I place an iron washer L', which is adapted to receive the thrust of the cutting-drill and prevent the upsetting of the threads on the end of the drill-rod. A set-screw M' is threaded into

the chuck in position to secure the cutting-drill to it. Upon the octagon portion of the drill-bar and to that portion confined between the cross-head E and the cross-piece B⁵ we place, first, a washer N against the cross-head, then a collar O against the washer, and secure it in position by set-screws P and against the washer a rubber ring Q. The first two fit freely on the drill-bar, and the last fits the drill-rod snug enough to maintain its position against the washer when the sliding carriage is moved away from the buffer-plate B³. The opposite end of the drill-bar is also turned round for a short distance and fits freely in a hole formed centrally of the width of the frame in a plate R, which is notched to fit on the guideways. A perspective view of this plate is shown in Fig. 5. A nut S is threaded to this end of the drill-rod and secures the plate freely against the shoulder formed at the end of the turned portion. Between this plate and the cross-head E we place freely on the octagon of the drill-bar a ratchet-wheel T and a pawl U, which is provided with two teeth, both of which are adapted to engage two teeth of the ratchet-wheel at each feeding movement of the pawl, and thus distribute the strain between them. This pawl is provided with a long shank portion which extends through a slot V in the side B' of the sliding carriage and is adapted to engage an inclined plate W. The inclined surface of this plate, which the end of the pawl engages, converges toward the axis of the drill-bar and operates to move the teeth of the pawl toward and by the center of the ratchet when the drill-bar-supporting carriage is moved backward by the manual rotation of the actuating-cams, as will be more fully explained hereinafter. This inclined plate comprises a strip of metal, which is secured at one end to the side B' and end plate B⁴ of the sliding carriage by the bolt C', which secures all three together. It is then extended outward at an angle away from the side to form the inclined surface, and the opposite end is bent inward toward and rests against the side B'. A rivet W' secures the plate at this end to the sides. This rivet is shown in Figs. 1 and 3.

To the side of the pawl we secure a pin X, and to a projection R', which is secured to the lower outside surface of the plate R, we secure a spring R², which is resiliently adapted to hold the pawl and to move it laterally in a position of readiness to engage the teeth of the ratchet-wheel. A second spring R³ is secured to a projecting block or portion R⁴ of the plate R, which bears on top of the said pawl and holds it with a constant pressure against the surface of the teeth. Consequently these two springs coöperating with the inclined plate and the reciprocal movement of the drill-bar-supporting carriage move the pawl to engage the ratchet-wheel and rotates it automatically, and we arrange the incline to move the pawl a distance sufficient to ro-

tate the wheel and drill-bar one-eighth of its circumference and turn each side of the octagon into the position of the preceding side. We leave a clearance-space between the end of the pawl and the inclined plate at the point where the pawl is in a position of disuse, which enables the octagon portion of the drill-rod to move out of the buffer-plate before the pawl contacts with the inclined surface and is moved to engage and rotate the ratchet-wheel and drill-rod.

The thread Y, which secures the forward end of the tube H to the cross-head E, is extended along the tube a short distance and a nut Z is fitted to it. A sleeve 1 is placed on the tube to cover and protect the thread, and between the nut and the cross-piece B⁶ a coiled expansive spring 3 is placed on the tube, which is adapted to resiliently throw the drill-carriage, the drill-bar, and the cutting-drill in the operative direction of its movement. By means of the nut the tension of the spring can be adjusted to cause the drill to strike hard or soft blows. Transversely across the sliding carriage of the machine we journal a shaft 4, which I preferably make of square steel, and turn a neck portion 5 at each end to form bearing portions. These set into semicircular recesses 6, formed in the sides of the carriage, and in order to make wide bearings for the shaft we secure to each side a cap 7, which I illustrate in perspective in Fig. 4. In order to secure these caps to the sides of the frame in a readily-detachable manner, we secure a pin 8 to each of the sides and cut a notch 9 in one edge of each cap, which fits over the pin and allows the bearing 10 of the cap to swing down on the shaft. A second notch 11 is made in the opposite bottom edge, which swings down over a screw 12, which is threaded into the sides and is adapted to secure the cap in position. On the square portion of the shaft inside the sliding carriage and on each side of the tube we place two double-armed cams 13, but can also use cams having three or four arms, securing the cams in place on the shaft by collars 14, placed on each side of them. On the shaft, outside of the frame, we secure fly-wheels 15, while the ends are adapted to receive a crank 16, by which the shaft and cams are manually rotated.

17 designates the stationary supporting-frame of the machine. It comprises four semicircular strips of metal 18, 19, 20, and 21, which are attached to or form a part of the straight strips 22 and 23, which are arranged opposite one another upon the inner ends of the diametrical center of the semicircular strips. These semicircular strips are located one at each end of the straight pieces, and the other two are located a short distance apart at the center. This frame supports the sliding carriage by its straight pieces being adapted to fit freely between two projecting strips 24 and 25, which form a part of the lower portion of the sides B' and B² of the frame

B, and which bear freely against the sides themselves, the projecting strips of the sides forming a guideway in which the straight strips of the stationary frame 17 are slidably seated. To the semicircular strip 18 of the stationary frame we secure a bracket 26, which is provided with a smooth hole adapted to receive the neck 27 of the feed-screw 28. The end of the feed-screw extends beyond the bracket, and a hand-wheel 29 is secured thereto by means of a nut. The feed-screw is made long enough to feed the sliding carriage back and forth in the stationary frame about three-quarters of its length. A nut 30 is secured to the sliding carriage by the same bolts which secure the rear end piece B⁴ to the sides B¹ and B² by means of two arms P', which form a part of it and which extend upward on either side of the nut to the opposite sides of said carriage-frame. This nut receives the feed-screw. A collar 31 is formed on the feed-screw close to its bracket-support, which with the handle confines the screw against longitudinal movement to the bracket. Consequently when the handle and screw are turned the nut and sliding-carriage frame are slidably moved on the stationary frame. Across the two centrally-disposed semicircular strips we secure a block 32, (which is shown only in Fig. 2,) and in the center of the block a swivel-pipe clamp 33 is pivotally connected by means of the stud 34 and nut 35. Only a portion of the pipe-clamp is shown, as it is not new. This swivel-pipe clamp is adapted to secure the stationary frame to a stoping-bar or to the trunnion-pin of a tripod, (neither of which are shown,) and enables the stationary frame to be moved and sit horizontally or vertically in any desired plane.

The operation is as follows: The crank is manually rotated in the direction of the arrow 36 in Fig. 2, which rotates the shaft and cams against the face of the cross-head F and thereby moves the drill-bar carriage back in the sliding carriage B on the ways, which compresses the actuating-spring 3 until one set of cam-arms move off the cross-head, when the drill-bar carriage and cutting-drill are projected forward by the actuating-spring and a blow is struck. In case the machine is not in position for the point of the cutting-drill to strike against a rock, the rubber buffer strikes the buffer-plate B⁵, which receives the blow of the drill-bar carriage. When this carriage is moved back by one of the cam-arms the octagon end of drill-bar, which is normally seated and locked in the octagon hole in the buffer-plate, is drawn back and out of it, and as soon as it is clear of it the shank end of the pawl contacts with the inclined plate, and as it moves back slides down it, and the pawl is moved transversely across the sliding carriage and over the top of the ratchet-wheel, engaging its teeth during the remaining portion of the backward stroke of the drill-bar carriage and rotating it one-

eighth of the drill-bar's circumference. The pawl first engages the ratchet-wheel with but one tooth, but near the end of its movement both of its teeth engage the ratchet-wheel and assist one another in turning it, for while the drill-bar and cutting-drill turn easily as they are supported by the turned portions at its ends in the cross-plates B³ and R, yet in drilling deep holes the machine is apt to work out of alinement with the drilled hole or the cutting-drill to work off into seams, causing it to bind against the sides of the drilled hole, which causes it to bind, and in such cases considerable power is required to turn it. In case there is any backlash of the teeth of the ratchet-wheel against the pawl, two teeth receive it instead of one. One of the principal improvements we have made, however, is to so lock the drill-bar and cutting-drill against rotative movement just before the striking of the point of the cutting-drill against the rock as to prevent any backlash of the ratchet-teeth against the pawl's teeth, which in drills in use is the cause of very frequent breakage of the teeth of both pawls and ratchet-wheels. We accomplish this on the forward stroke of the drill-bar carriage, the forward octagon end of which passes into and through the octagon hole in the buffer-plate. During the forward stroke of the drill-carriage the horizontal spring R², which bears on top of the pawl, holds the ratchet-wheel and rod from turning, and while the vertical spring moves the pawl back against and up the inclined plate, yet the forward movement is so quick and the friction of the compressed spring is so great against the nut Z that the pawl when moving back does not turn the ratchet-wheel backward.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with the stationary frame, the sliding carriage, and the drill-supporting carriage adapted to be reciprocated in said sliding carriage, of the octagonal drill-bar rotatively secured to said reciprocating carriage, the chuck, the cutting-drill, the collar, washer and buffer-ring on said drill-bar and the buffer-plate having an octagonal aperture therein adapted to receive the octagon front end of said drill-bar and hold it against rotative movement just before and at the close of its forward stroke, substantially as described.

2. In a rock-drill, the combination with a stationary frame and slidable carriage and means including a screw for manually feeding said slidable carriage in said stationary frame, of a reciprocating drill-supporting frame slidably secured in said slidable carriage, and comprising a tube, a cross-head secured at each end of said tube, a thread on one end of said tube, an adjustable nut on said thread, a sleeve surrounding said thread and an expanding spring on said tube arranged between said nut and a fixed abut-

ment on said slidable carriage, substantially as described.

3. In a rock-drill the combination with the slidable carriage of the polygonal drill-bar, a carriage adapted to support said drill-bar and reciprocatively mounted in said slidable frame, an expansive spring adapted to violently move said drill-supporting carriage in one direction of its movement, a crank and shaft, cams mounted on said shaft adapted and arranged to move said drill-supporting carriage in the opposite direction of its movement and to compress said spring, a ratchet-wheel secured to move revolubly with said drill-rod, means for revolubly securing said drill-bar to said drill-supporting carriage, and a spring-controlled pawl having two integral teeth arranged and adapted to engage said ratchet-wheel during the backward stroke of said drill-bar and to impart to said ratchet-wheel a partial rotative movement equal to the circumferential pitch of the polygonal sides of said drill-bar from one another, substantially as described.

4. In a rock-drill, the combination with the ratchet-wheel, the drill-bar and the slidable carriage, of the pawl having two integral teeth, the ratchet-plate secured to said drill-rod adjacent to said ratchet-wheel and supporting said pawl, the vertical spring also se-

cured to said plate and in operative engagement with said pawl, the horizontal spring also in operative engagement with said pawl, the slot in the side of the carriage through which said pawl extends and the inclined plate secured to said carriage and adapted to move said pawl on its backward stroke to operatively engage said ratchet-wheel, as set forth.

5. In a rock-drill, the combination of the slidable carriage, the square crank-shaft, the cams, the recess-bearings in the sides of said slidable carriage, the turned bearings in said shaft, the fly-wheels and the collars with the caps, having a notch in one side edge, a pin secured to the sides of said carriage adapted to fit therein, a bearing in the caps adapted to fit over and on said bearings in said shaft, a notch in the opposite bottom edge of said caps and a screw threaded to each side in the path of the last-named notch, whereby said caps are readily secured and detached to the sides of said carriage, as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

FREDERICK CRAMER.
WILLIAM F. CRAMER.

Witnesses:

ALFRED N. PARNALL,
WILLIAM E. SCOTT.