(No Model.) 2 Sheets—Sheet 1.

G. T. REISS & J. B. CROCKER.

DRILLING MACHINE.

No. 547,741. Patented Oct. 8, 1895.

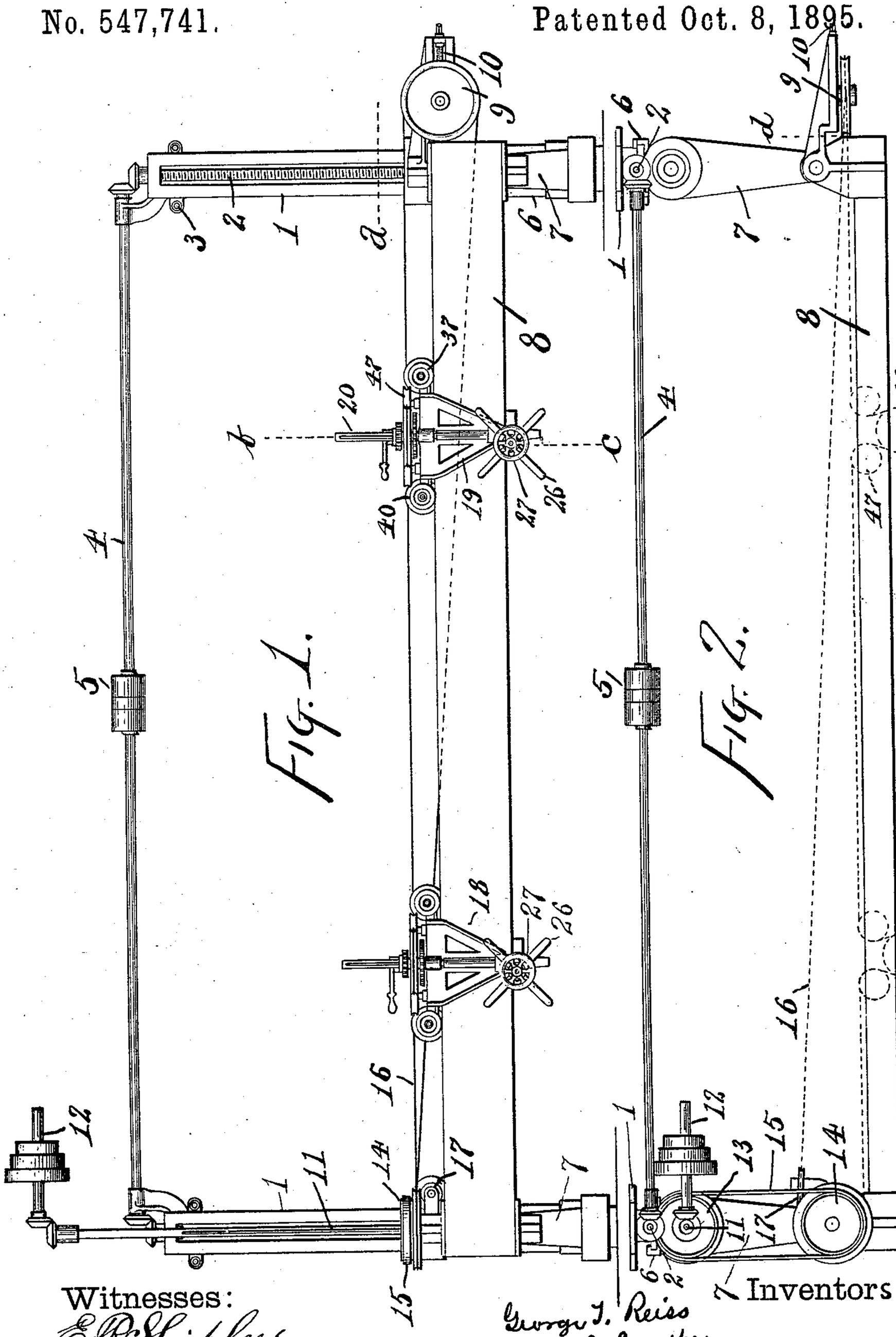

Fig. 1.

Fig. 2.

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(No Model.)

2 Sheets—Sheet 2.

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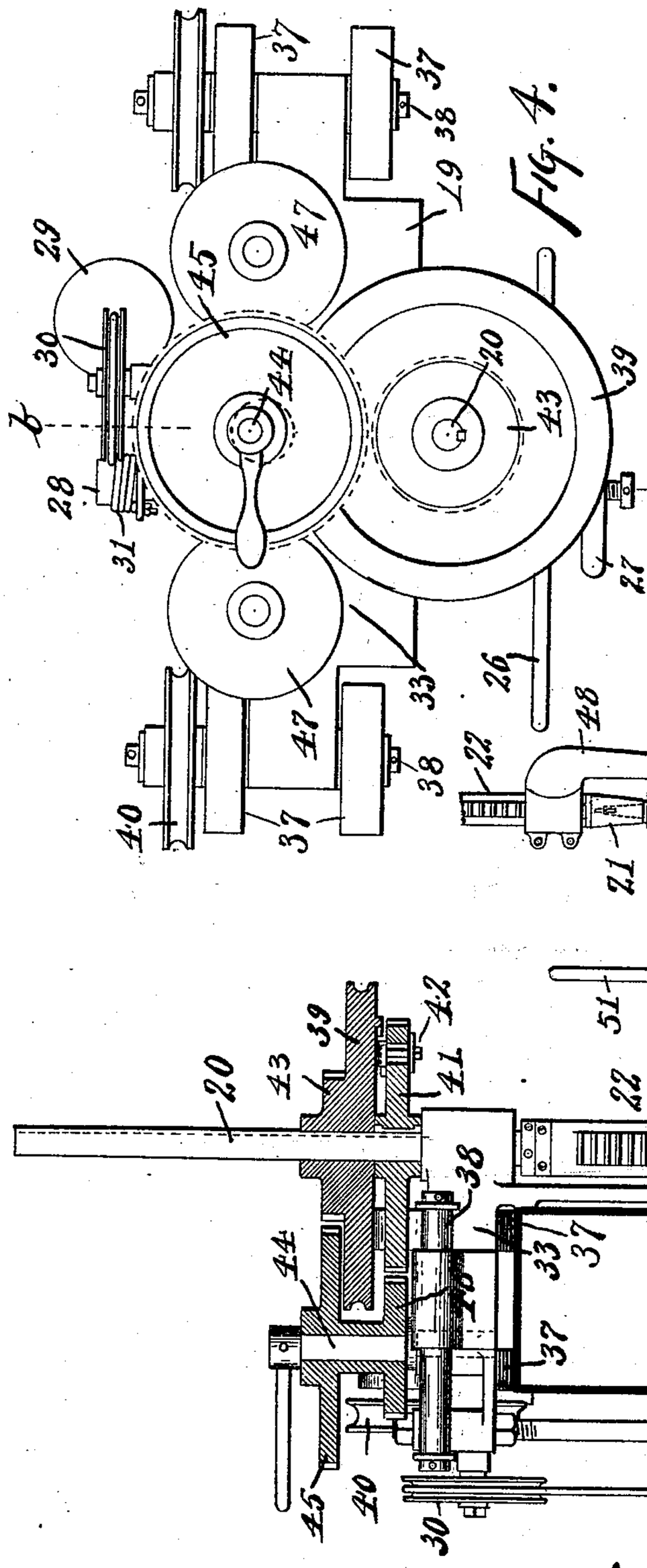

Fig. 4.

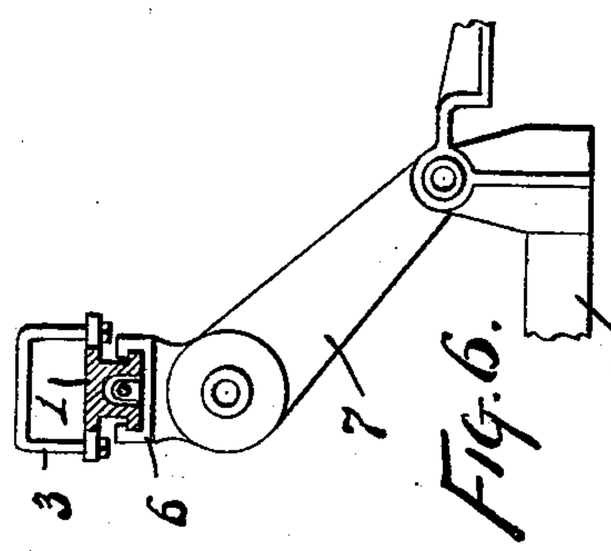

Fig. 6.

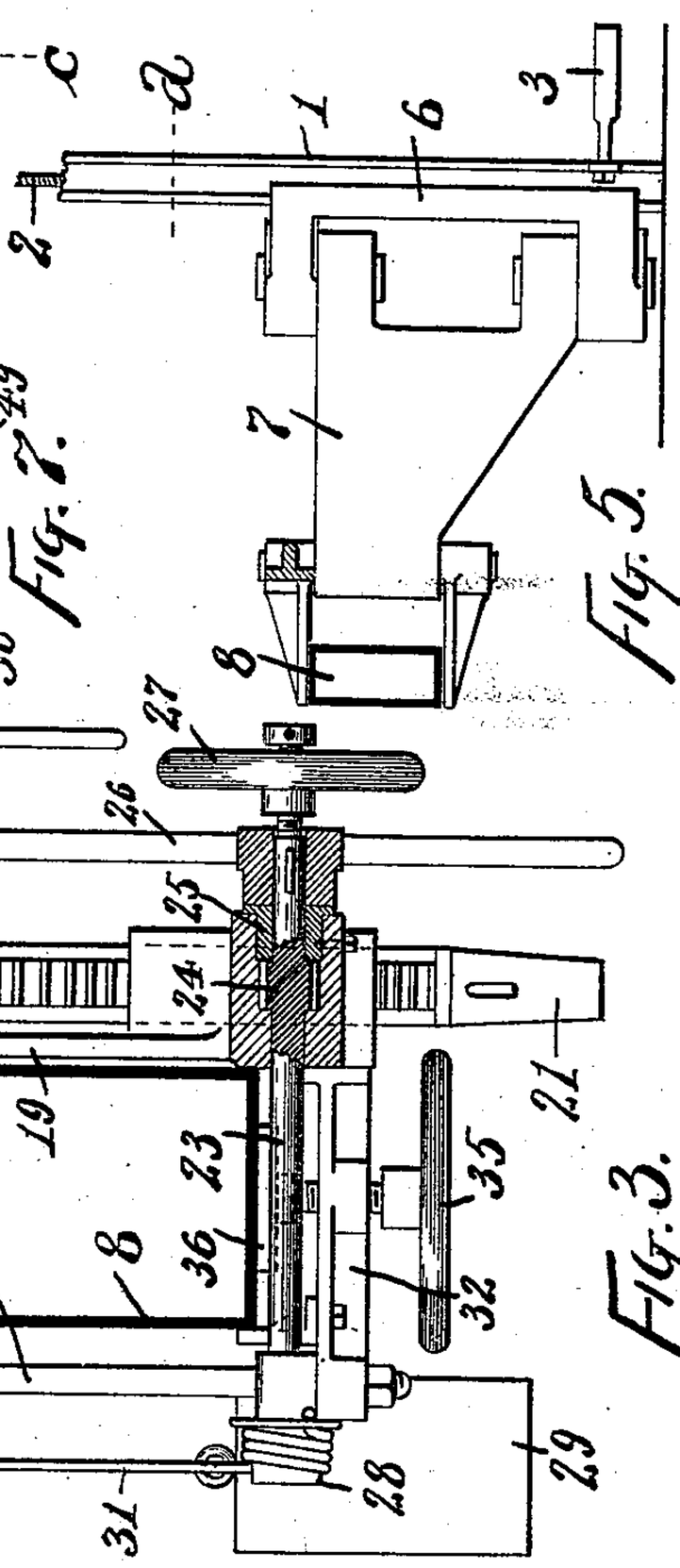

Fig. 5.

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE T. REISS AND JOHN B. CROCKER, OF HAMILTON, OHIO, ASSIGNORS TO THE NILES TOOL WORKS COMPANY, OF SAME PLACE.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 547,741, dated October 8, 1895.

Application filed March 29, 1895. Serial No. 543,694. (No model.)

To all whom it may concern:

Be it known that we, GEORGE T. REISS and JOHN B. CROCKER, of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention pertains to a machine for drilling and reaming girders and similar long pieces. The machine involves a long horizontal rail capable of transverse adjustment both vertically and horizontally and having one or more drilling-heads sliding upon it and provided each with a vertical spindle, provision being also made for the use of a horizontal spindle.

The invention will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front view of a machine exemplifying our invention; Fig. 2, a plan of the same; Fig. 3, a side elevation of one of the drilling-heads, certain upper parts appearing in vertical section in the plane of line *b* of Figs. 1 and 4 and certain lower parts appearing in vertical section in the plane of line *c* of Figs. 1 and 4; Fig. 4, a plan of one of the drilling-heads; Fig. 5, a side elevation of one of the supporting-columns, showing one of the swinging brackets and the rail, a certain part appearing in vertical transverse section in the plane of line *d* of Fig. 2; Fig. 6, a plan of the parts shown in Fig. 5, and Fig. 7 a side elevation of the horizontal spindle attachment.

Where the drawings show parts in duplicate the numerals of reference are in cases applied but once.

In the drawings, confining attention for the present to Figs. 1 and 2, 1 indicates a pair of columns designed for the support of the machine and intended to be either self-sustaining or to be secured against such posts or columns as may be found conveniently located in the shop, the latter plan having been the one thus far adopted in practice; 2, vertical screws at these columns to serve in raising and lowering a rail supported by the columns; 3, Fig. 6, straps illustrating convenient means for attaching the columns to posts or columns of the shop; 4, a horizontal shaft extending from column to column and bevel-geared at its ends to the screws 2; 5, tight and loose pulleys on this shaft designed to be engaged by open and crossed belts driven from a suitable shaft, whereby the screws may be turned by power in either desired direction, so as to raise or lower the rail of the machine; 6, Fig. 5, a saddle gibbed to each column and engaged by the screws 2 thereof; 7, strong swinging arms with their heels united to the saddles by vertical pivots; 8, a rail having its ends united by vertical pivots to the free ends of the arm 7, whereby the rail is capable of swinging movement to and from the plane of the columns, the rail being in the form of a rigid girder adapted to have one or more drilling-heads slide upon it; 9, an idle sheave mounted on a horizontal axis on a bracket forming a rigid extension at one end of the rail and moving with the rail; 10, a stretcher-screw by means of which this sheave may be adjusted somewhat in the direction of the length of the rail; 11, a splined shaft disposed vertically in the axial line of the pivot uniting the left-hand one of the swinging arms to its column; 12, a counter-shaft connected with the upper end of shaft 11 and illustrating means by which power may be transmitted to the machine for operating the drilling-heads; 13, a pulley mounted on vertical shaft 11 at the left-hand swinging arm; 14, a pulley in the horizontal plane of pulley 13 and with its axis coinciding with the pivot uniting the left-hand swinging arm to the rail, this pulley 14 being united with a sheave-pulley; 15, a belt engaging pulleys 13 and 14; 16, a round belt engaging the sheave of pulley 14 and engaging sheave 9; 17, an idle sheave near pulley 14 to give support to the slack side of belt 16, and 18 a pair of drilling-heads, of a construction to be explained, arranged for traverse upon the rail and having each a vertical spindle driven by belt 16.

Driving-belt to counter-shaft 12 gives motion to splined shaft 11. Belt 15 transmits the motion to pulley 14 and its sheave, by means of which the long belt 16 is driven, this belt giving motion to the drilling-spindles and being kept in proper tension by the stretcher

10. With the arms 7 in the position shown in Fig. 2 the rail is in its farthest position out from the columns. The drilling-heads may be shifted along the rail to bring them in desired longitudinal positions. By shifting the rail to the right or to the left the arms swing rearwardly, thus giving the transverse adjustment to the rail and drilling-spindles. The driving-belt maintains its driving relationship throughout the range of movement of the rail or of the drilling-heads upon the rail. A group of girders may be laid upon the floor or on trestles below and parallel with the rail, and the drilling-spindles may be brought into operating positions as desired. The rail and its attachments may be adjusted to desired heights upon the columns by means of the screws 2, operated by means of belts on pulleys 5.

The drilling-heads will now be described, reference being preferably had to Figs. 3 and 4, in which 19 indicates the front plate of the drilling-head; 20, the drill-spindle journaled in the front thereof; 21, the drill-socket; 22, the racked sleeve on the drill-spindle, as is usual in drilling-machines; 23, feed-shaft journaled in the drilling-head under and at right angles to the rail; 24, pinion on the feed-shaft, engaging the rack of sleeve 22; 25, a bushing in the front bearing of the feed-shaft, its rear end coming against the face of the pinion 24; 26, feed-wheel splined on the front end of the feed-shaft, its hub coming against the outer face of bushing 25; 27, a clamp-nut in the form of a hand-wheel threaded on the front end of the feed-shaft and serving when screwed up to force feed-wheel 26 against bushing 25 and to solidly clamp the bushing between the feed-wheel and the pinion, and thus lock the feed-shaft against rotation and the drill-spindle against vertical motion; 28, a reel on the rear end of the feed-shaft; 29, a counterbalance-weight; 30, an idle sheave supported by the rear top of the drilling-head; 31, a rope or chain connected to weight 29 and passing thence up over sheave 30 and then down to the reel 28; 32, a foot-plate of the drilling-head, extending from the front plate rearwardly under the rail; 33, top plate of the drilling-head, extending from the front plate rearwardly over the rail; 34, nutted rod at the rear of the rail, uniting the top and bottom plates of the drilling-head, the drilling-head thus forming a strong structure completely surrounding the rail; 35, a clamp-screw arranged vertically in the lower plate 32; 36, a clamp-pad on the upper end of this screw, engaging the under surface of the rail; 37, four wheels mounted on the upper plate 33 and running on the upper surface of the rail as a track, and 38 the shafts of these wheels, the nearer wheels being omitted from Fig. 3, in order that they may not hide parts beyond their plane.

When the clamp 35 is loose, the drilling-head may be shifted along the rail, wheels 37 reducing the friction. The head may then be clamped firmly to the rail. The spindle is fed downward by feed-wheel 26, weight 29 counterbalancing the weight of the spindle. In such case the feeding of the drill is done by hand through feed-wheel 26; but rope 31 may be unwound from reel 28 and rewound in the opposite direction, under which conditions the tendency of weight 29 is to move the drill-spindle downward, thus forming a power-feed. When the weight is thus used for feeding purposes, the spindle is of course no longer counterbalanced, and feed-wheel 26 will be employed in elevating the spindle against the tendency of the weight, and it may also be used in aiding the weight in producing the feeding of the drill.

Proceeding with Figs. 3 and 4, 39 indicates a sheave loose on the drilling-spindle; 40, a pair of sheaves loose on the rear ends of wheel-shafts 38; 41, a spur-gear splined to the drill-spindle below sheave 39; 42, a locking-bolt sliding in and out in gear 41 and adapted to lock it to sheave 39, precisely as the so-called "cone nut" is employed in engine-lathes in locking the belt-cone to the spur-gear on the lathe-spindle; 43, spur-gear fast with sheave 39; 44, eccentric vertical stud mounted in the top plate of the drilling-head to the rear of the drill-spindle; 45, spur-gear loose on this stud and adapted for engagement with gear 43; 46, spur-gear fast with gear 45 and adapted for engagement with spur-gear 41, and 47 sheaves loose on studs in the top plate of the drilling-head, these sheaves being in the plane of sheave 39 with their rear peripheries in the vertical plane of sheaves 40.

The driving-belt 16 comes to the drill-head, rests on sheaves 40, turns between sheaves 47, and wraps partly around sheave 39. The belt thus gives motion to sheave 39, and if locking-bolt 42 is in locking position the drilling-spindle will be turned at the speed of sheave 39. By disengaging the locking-bolt and turning the eccentric-stud 44 the back gear is thrown into operation and the drill-spindle becomes driven at a greatly-reduced speed and with correspondingly-increased power. In the work for which this machine has been designed the back gear will most always be employed and the rail will be provided with a multiplicity of drilling-heads. Either of the several drill-spindles may be stopped independently by throwing its back gear out of operation, which may be done while the drill-spindles are running. If the back gears are not being employed, then a given drill-spindle may be caused to remain stationary by disengaging its locking-bolt 42, thus rendering the given drill-head idle.

In certain classes of girder work horizontal reaming is called for. For this work reference is had to the attachment shown in Fig. 7, in which 48 indicates an elbow-arm, having in its upper member a clamp bored to fit the

lower end of the sleeve 22 of the drill-spindle, its lower member having a horizontal journal axially intersecting the axis of the drill-spindle; 49, a pair of bevel-gears, one journaled in the lower bearing of the elbow and the other shanked into the drill-socket 21 of the drilling-spindle; 50, a horizontal shaft splined in the lower bevel-gear; 51, a handle-bar on the outer end of shaft 50, and 52 a drill-socket on the inner end of this shaft.

The apparatus of Fig. 7 is to be clamped to the sleeve of one of the drilling-heads and a shaft 50 swung to the desired pointing direction. The drill-spindle is then to be raised or lowered to the proper level, after which clamp-nut 27 of the drilling-head is to be tightened, thus locking the drill-spindle and reaming apparatus against vertical or angular disturbance. The reamer is then put in socket 52 and the drill spindle started into rotation and the reamer urged endwise to its work by hand-power 51.

We claim as our invention—

1. In a drilling machine, the combination, substantially as set forth, of a pair of arms united by vertical pivots to fixed supports, a horizontal rail with its end united by vertical pivots to the free ends of said arms, a drilling head fitted to traverse said rail, and a driving belt engaging sheaves carried by the rail and drilling head.

2. In a drilling machine, the combination, substantially as set forth, of a pair of columns, saddles fitted to slide thereon, arms with their heels united to said saddles by vertical pivots, a horizontal rail having its ends united to the free ends of said arms by vertical pivots, and a drilling head fitted to slide upon said rail.

3. In a drilling machine, the combination, substantially as set forth, of a pair of columns, vertical screws mounted therein, saddles fitted to slide on the columns and engaged by said screws, arms with their heels united to said saddles by vertical pivots, a rail with its ends united to the free ends of said arms by vertical pivots, and a drilling head fitted to slide upon said rail.

4. In a drilling machine, the combination, substantially as set forth, of a pair of columns, straps connected with said columns and adapted to serve in uniting said columns to fixed posts, saddles fitted to slide on said columns, arms having their heels united to said saddles by vertical pivots, a rail having its ends united to the free ends of said arms by vertical pivots, and a drilling head fitted to slide on said rail.

5. In a drilling machine, the combination, substantially as set forth, of a pair of columns, screws mounted therein, a shaft extending from column to column and bevel geared at its ends to said screws, power receiving devices, as tight and loose pulleys, on said shaft, saddles fitted to slide on said columns and engaged by said screws, arms with their heels united to said saddles by vertical pivots, a rail having its ends united to the free ends of said arms by vertical pivots, and a drilling head fitted to slide on said rail.

6. In a drilling machine, the combination, substantially as set forth, of a pair of arms having their heels supported by vertical pivots, a driving shaft disposed in the axial line of one of said pivots, a rail having its ends united to the free ends of said arms by vertical pivots, a sheave with its axis in the axial line of the outer pivot of the arm pertaining to said driving shaft, pulleys for transmitting motion from said driving shaft to said sheave, a sheave carried by the rail at the end opposite the driving shaft, a drilling head fitted to move upon said rail, and sheaves carried by said drilling head and adapted to be engaged by a belt engaging the before mentioned sheaves.

7. In a drilling machine, the combination, substantially as set forth, of a rail, a drilling head having a plate disposed at the front of the rail and having plates projecting rearwardly from said front plate over and under the rail, and a nutted rod to the rear of the rail engaging said upper and lower plates.

8. In a drilling machine, the combination, substantially as set forth, of a rail, two drilling heads arranged to shift along the rail, a vertical drill spindle in each drilling head, a loose sheave upon each drill spindle, a driving belt running lengthwise of the rail and engaging said sheaves, and disengageable back gearing at each head connecting said sheaves and their spindles.

9. In a drilling machine, the combination, substantially as set forth, of a drilling head, a vertical drill spindle carried thereby, a horizontal feed shaft connected with the spindle, a reel on said feed shaft, a weight, and a rope or chain connected with said weight and reel and adapted to be wound upon said reel in either direction alternatively so as to cause the weight to produce either a counterbalancing of the spindle or a forcible downward feed for the spindle.

10. In a drilling machine, the combination, substantially as set forth, of a drill spindle, a feed sleeve thereon, a horizontal bearing clamped to said sleeve and adapted to rise and fall therewith, a bevel-gear carried by the lower end of the drill spindle, a bevel-gear journaled in said bearing, and a shaft splined in said last-mentioned bevel-gear and having a drill socket at one end and a handle bar at the other end.

11. In a drilling machine, the combination, substantially as set forth, of a vertical drill spindle, a feed sleeve thereon, a reaming shaft bevel-geared to the lower end of said drill spindle and supported by a bearing carried by said feed sleeve, and a clamp for locking said feed sleeve in position of vertical adjustment.

12. In a drilling machine, the combination, substantially as set forth, of a vertical drill-

spindle, a racked feed-sleeve thereon, a feed shaft having a pinion engaging the rack of said sleeve, a feed wheel splined on said feed shaft, a bearing on said feed shaft between its pinion and said feed wheel, a clamp-nut on said feed shaft adapted to clamp said bearing between said pinion and feed wheel, and a horizontal reaming spindle bevel-geared to said drill spindle and carried in a bearing supported by said feed sleeve.

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