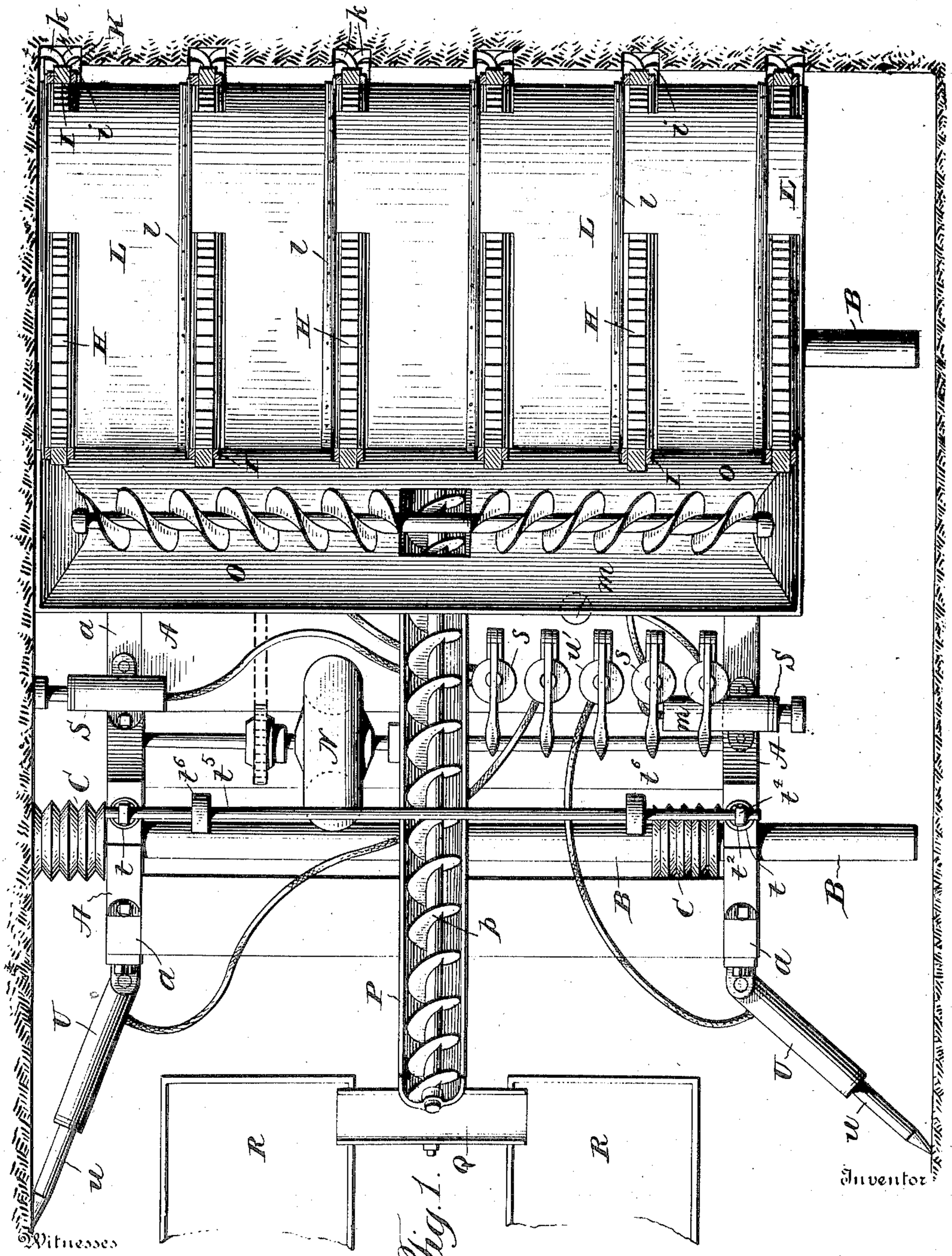
No. 816,923. PATENTED APR. 3, 1906.

W. A. LATHROP.

MACHINE FOR CUTTING HEADINGS.

APPLICATION FILED AUG. 31, 1903.

6 SHEETS—SHEET 1.



Witnesses
Jas. E. Hutchinson.
J. L. Lawlor.

Inventor
By William A. Lathrop.
Edwin J. Prindle, Attorney

No. 816,923. PATENTED APR. 3, 1906.

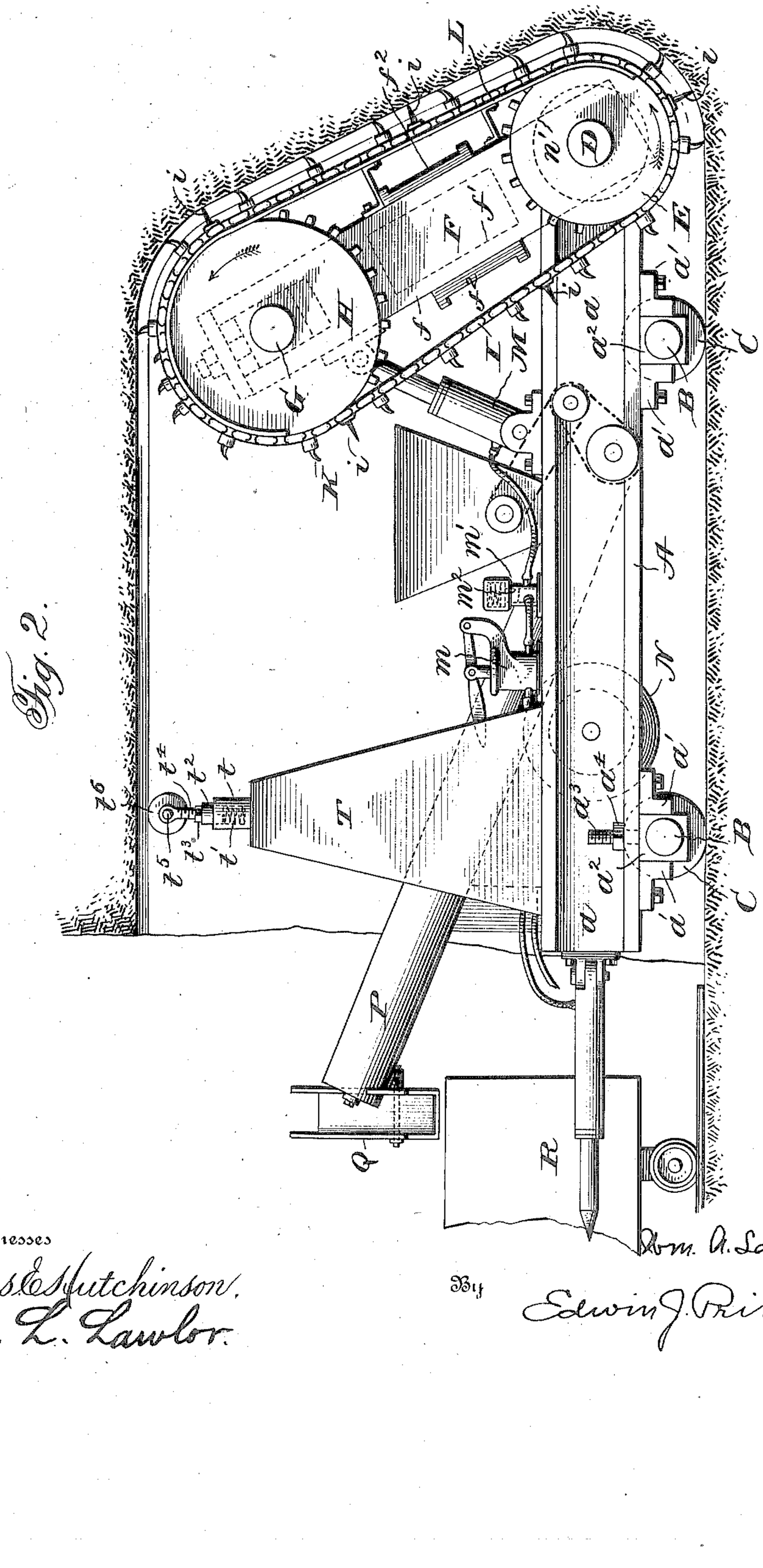
W. A. LATHROP.

MACHINE FOR CUTTING HEADINGS.

APPLICATION FILED AUG. 31, 1903.

6 SHEETS—SHEET 2.

Fig. 2.



Witnesses

Jas. E. Hutchinson.

J. L. Taylor.

Inventor

Wm. A. Lathrop,

By Edwin J. Rindle,

Attorney

No. 816,923. PATENTED APR. 3, 1906.

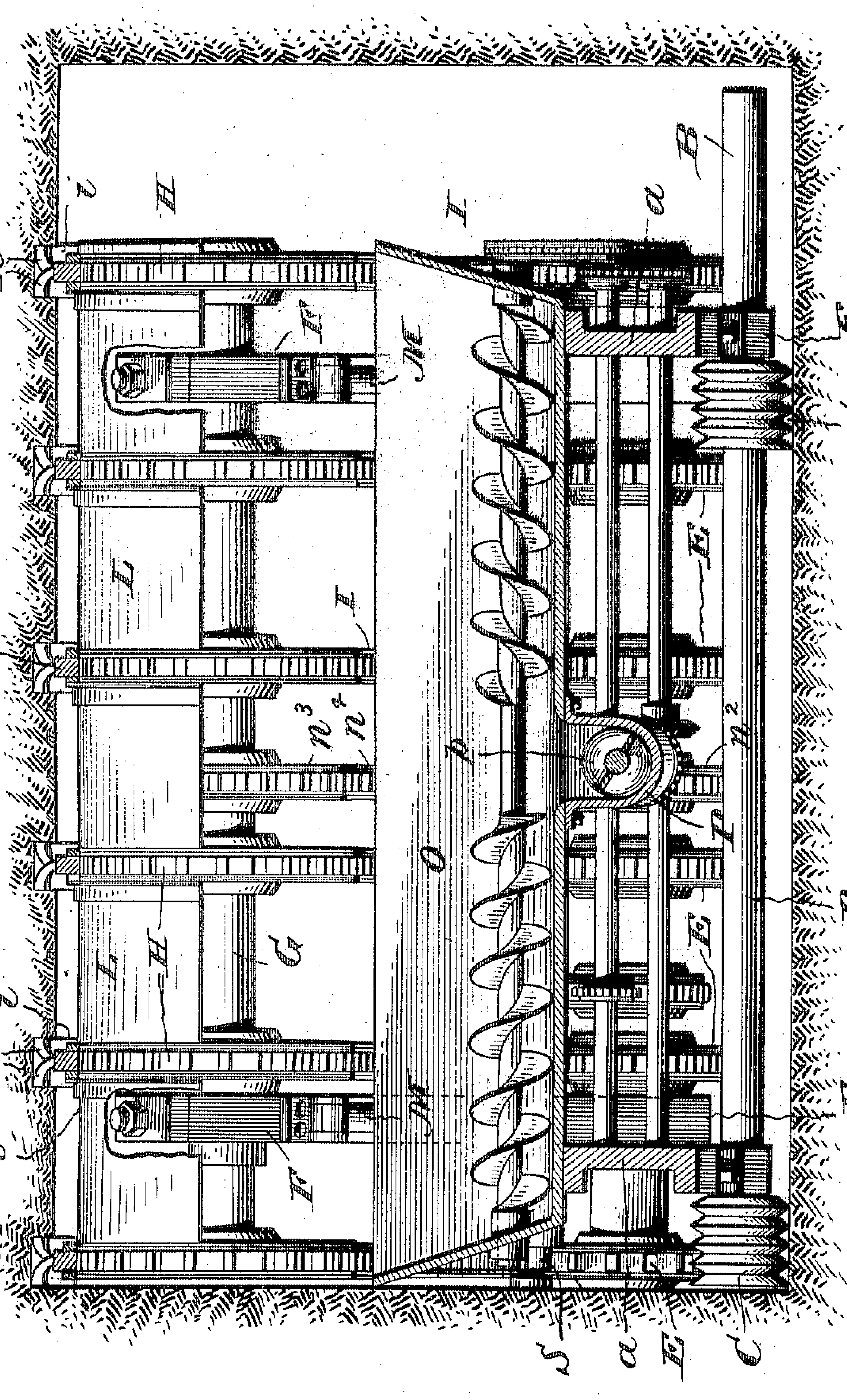
W. A. LATHROP.

MACHINE FOR CUTTING HEADINGS.

APPLICATION FILED AUG. 31, 1903.

6 SHEETS—SHEET 3.

Fig. 3.



Witnesses

Jas. E. Hutchinson.

J. L. Lawlor.

Inventor

William A. Lathrop.

By Edwin J. Prindle,

Attorney.

No. 816,923. PATENTED APR. 3, 1906.

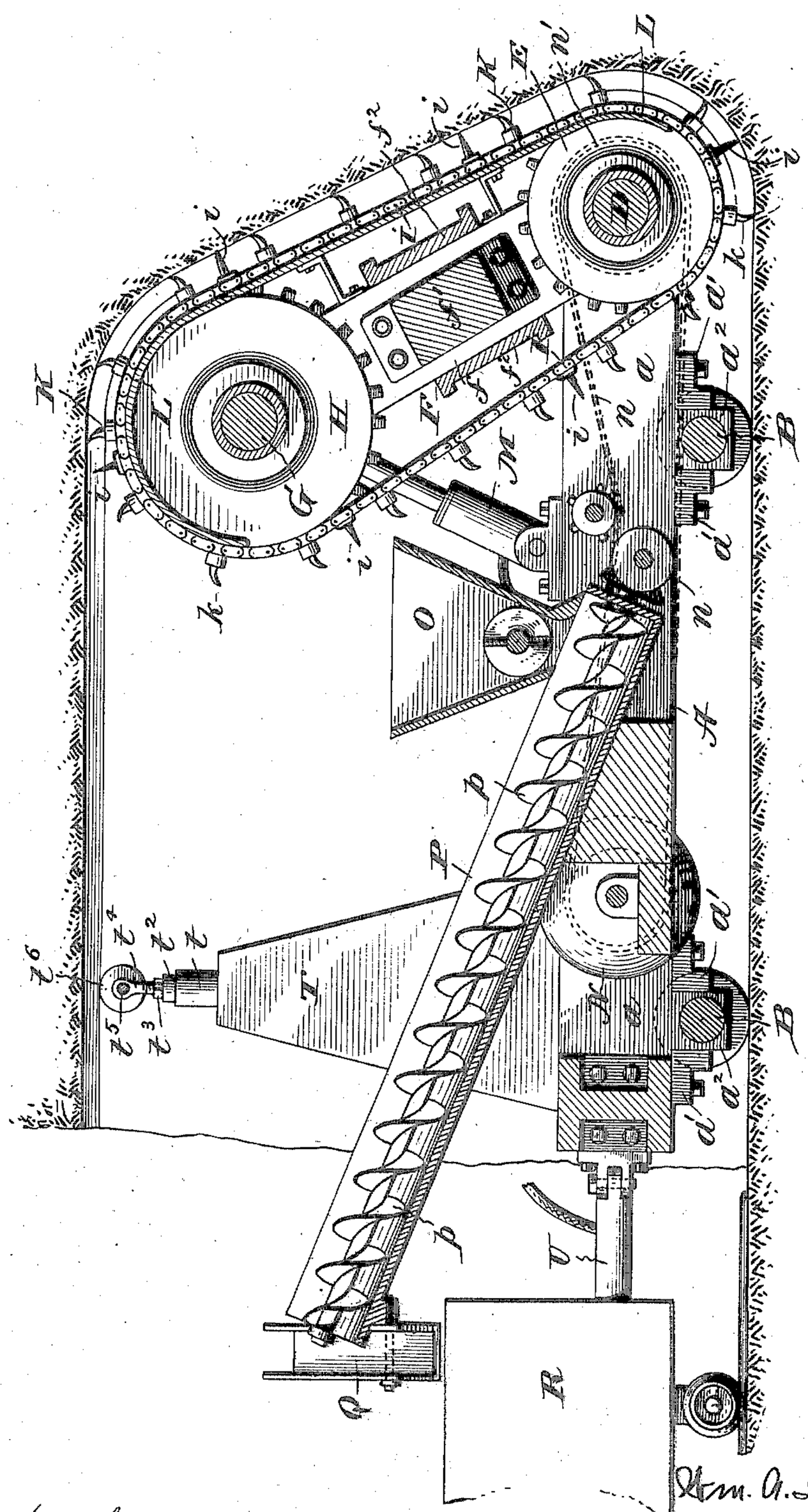
W. A. LATHROP.

MACHINE FOR CUTTING HEADINGS.

APPLICATION FILED AUG. 31, 1903.

6 SHEETS—SHEET 4.

Fig. 4.



Witnesses

Jas. E. Hutchinson

J. L. Lawlor.

Inventor

Wm. A. Lathrop

By Edwin J. Prindle.

Attorney

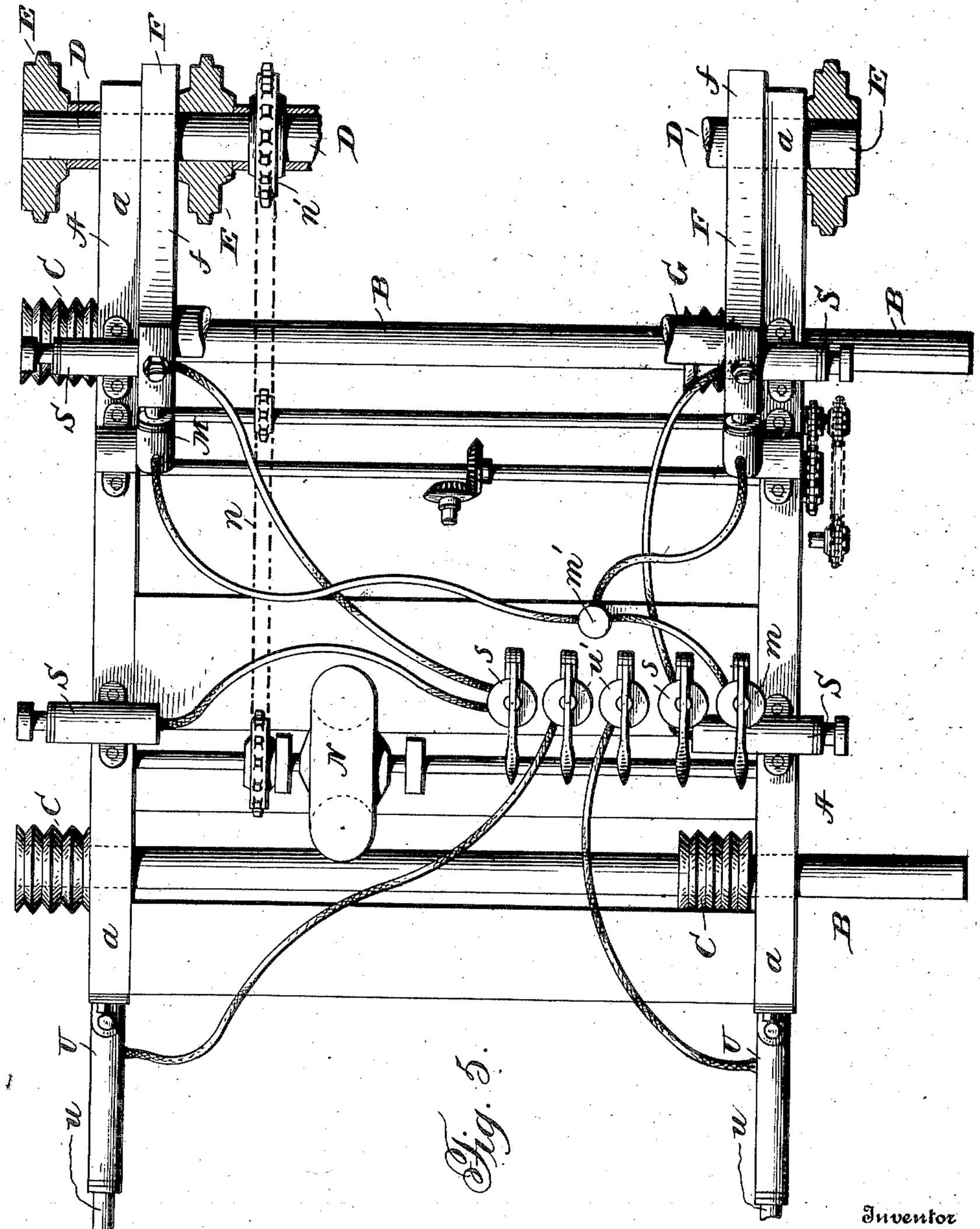
No. 816,923. PATENTED APR. 3, 1906.

W. A. LATHROP.

MACHINE FOR CUTTING HEADINGS.

APPLICATION FILED AUG. 31, 1903.

6 SHEETS—SHEET 5.



Witnesses

Jas. E. Hutchinson.

J. L. Lawlor.

Inventor

William A. Lathrop,

By Edwin J. Rindle,

Attorney

No. 816,923. PATENTED APR. 3, 1906.

W. A. LATHROP.

MACHINE FOR CUTTING HEADINGS.

APPLICATION FILED AUG. 31, 1903.

6 SHEETS—SHEET 6.

Fig. 6.

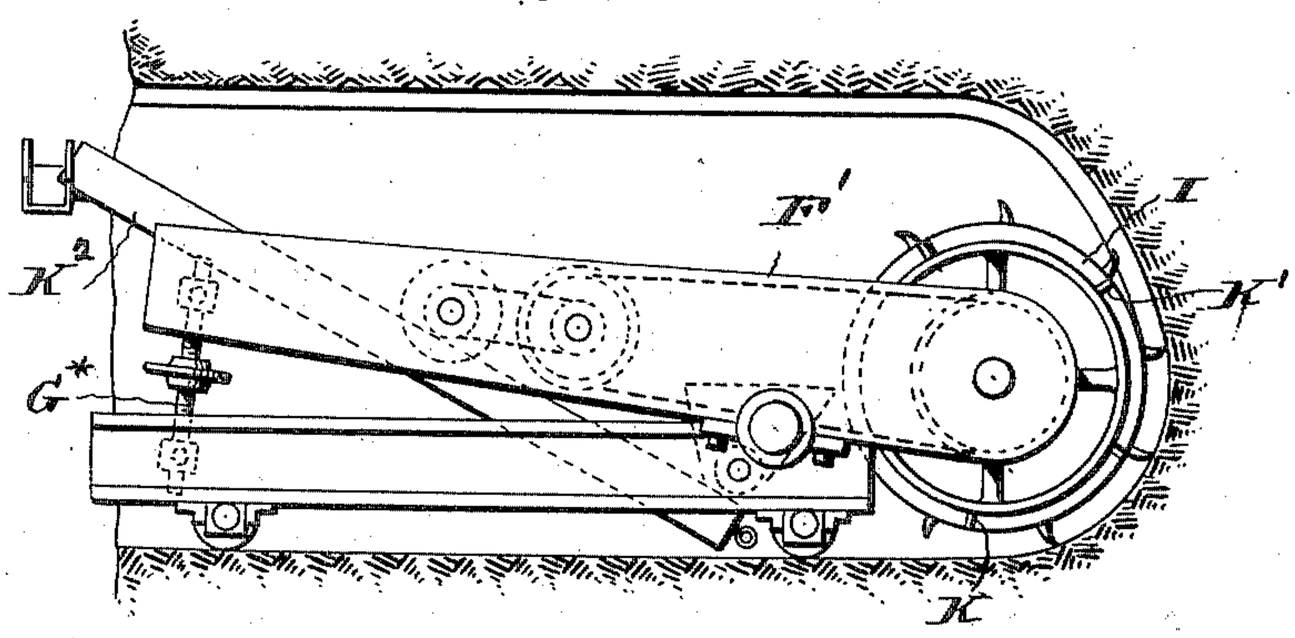


Fig. 7.

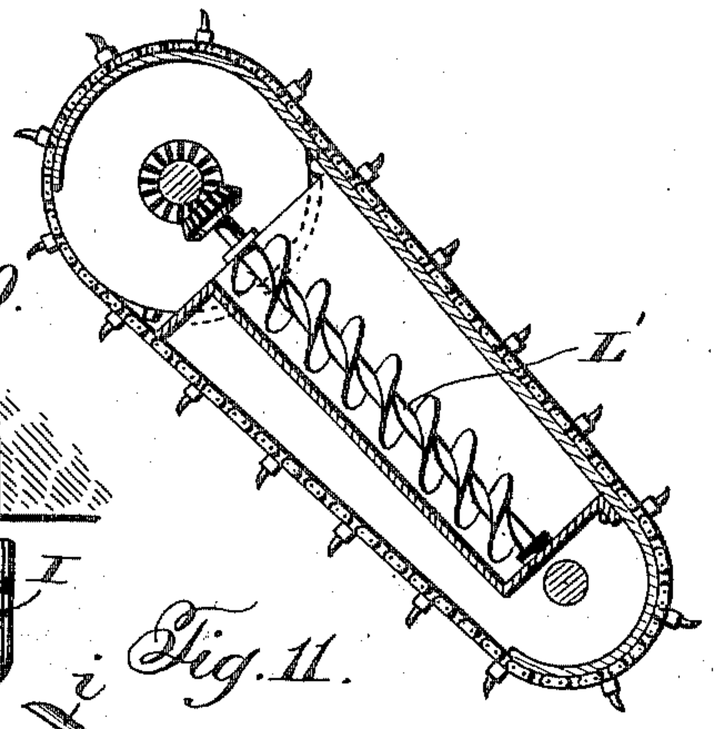


Fig. 10.

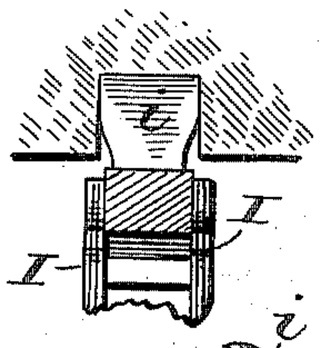


Fig. 11.

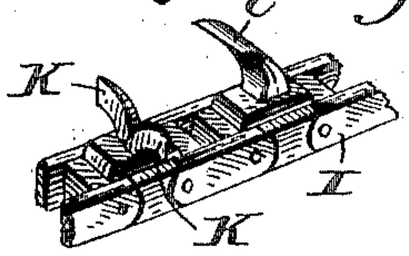


Fig. 8.

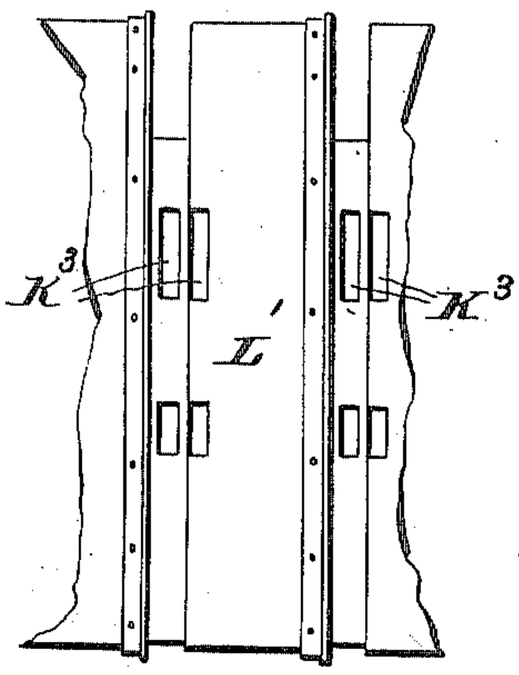
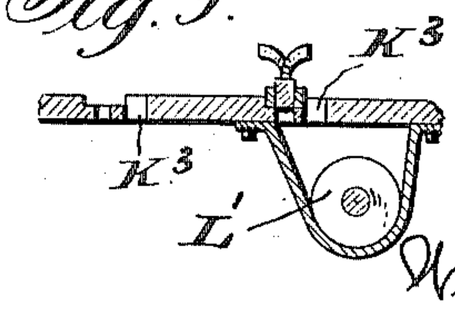


Fig. 9.



Witnesses

Jas. E. Hutchinson.

J. L. Taylor.

Inventor

William A. Lathrop,

By Edwin J. Rindle,

Attorney

UNITED STATES PATENT OFFICE.

WILLIAM ARTHUR LATHROP, OF WILKES-BARRE, PENNSYLVANIA.

MACHINE FOR CUTTING HEADINGS.

No. 816,923. Specification of Letters Patent. Patented April 3, 1906.

Application filed August 31, 1903. Serial No. 171,437.

To all whom it may concern:

Be it known that I, WILLIAM ARTHUR LATHROP, of Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented a certain new and useful Improvement in Machines for Cutting Headings; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical cross-sectional view of the same. Fig. 4 is a longitudinal cross-sectional view of the same. Fig. 5 is a plan view of the frame upon which the operating parts are mounted, the parts for cutting and conveying coal being omitted. Fig. 6 is a side view of another embodiment of my invention. Figs. 7 and 8 are vertical sectional views of another embodiment of my invention, showing, respectively, the coal-cutting parts carried by the swing-frame and the shield carried by such frame. Fig. 9 is a sectional view of the parts shown in Fig. 7, the section being taken on a plane perpendicular to that of the section in the said figure; and Fig. 10 is a detail view of a section of the cutting-chain.

The object of my invention has been to provide a machine which while adapted for other uses is specially adapted for driving or cutting headings in mines, and particularly in mines of bituminous coal; and to such ends my invention consists in the machine for cutting headings, substantially as hereinafter specified.

In carrying my invention into practice I provide a frame A, that is supported upon wheels or skids and upon which frame the various parts of my machine are mounted. The said frame preferably consists of side beams *a*, that are connected by suitable braces. The side beams are provided with suitable brackets *a'* for receiving bearing-boxes a^2, and the latter receive and are supported upon axles B, the said axles having fixed upon them and being supported by wheels C or skids, if preferred. The front boxes are situated at a point somewhat back of the forward ends of the side beams *a* for a reason hereinafter stated, and the rear axle-boxes are mounted in their brackets so as to be capable of vertical movement in the same, and screws a^3, resting upon the said axle-boxes and engaging threaded holes in the frame A and locked by nuts a^4 upon the side beams *a*, are provided, so that the frame can be raised and lowered upon the rear axle to raise or lower the forward ends of the side beams *a*, for reasons which will appear later. The wheels C may, if desired, be provided with circumferential ribs and grooves to prevent lateral slipping, and all of said wheels are placed upon the same sides of their respective side beams—as, for instance, all on the left side or all on the right side thereof—the ends of the axles upon the side of the side beam *a*, whose outer side is unobstructed by the wheels B, being extended, so that the frame A can be moved laterally upon the axles without moving the wheels C laterally. The forward ends of the side beams *a* are provided with bearings, in which is mounted a shaft D. Such shaft is extended laterally beyond the said side beams and upon said extended ends and at intermediate points, preferably equidistant from each other, is provided with sprocket-wheels E. A frame F, consisting, preferably, of side beams *f*, an intermediate brace *f'*, and outer braces f^2, is mounted to swing upon the shaft D, the said frame being preferably mounted with its side beams between and bearing against the side beams *a* of the main frame. The upper ends of the side beams *f* of the swinging frame are provided with bearings, in which is mounted a shaft G parallel and similar to the shaft D. The shaft G is provided with sprocket-wheels H, corresponding to, but preferably larger than, the sprocket-wheels E of the lower shaft, and sprocket-chains I pass around each pair of sprocket-wheels E and H, such sprocket-chains being provided with cutters K for cutting the coal. The sprocket-chains and cutters may be of any desired construction. In order to keep the sprocket-chains tight, the bearing-boxes of the upper shaft may be adjustable in the side beams *f*, and screws may be provided for effecting such adjustment. The cutters K preferably consist of pairs of teeth *k*, projecting laterally beyond the limits of the sprocket-chains.

A shield L is mounted upon the frame F, such shield extending beneath and supporting the forward laps of the sprocket-chains and being cut away for the sprocket-wheels to reach the sprocket-chains. The said shield is preferably provided with a side guide or brace for each sprocket-chain upon the side of the latter opposite that toward which the axles B are extended, and such

guide may take the form of an angle-iron *l*, fastened to the shield. The chains are at intervals provided with lateral wings *i*, which travel close to the face of the shield and extend laterally at least as far as the cutters K. The wings *i* may also be cutters, if desired.

In order to adjust the inclination of the frame F, and consequently the vertical height of the upper limit of the cutters' travel, hydraulic jacks M are pivoted to the side bars *a* and their plungers are pivoted to the side bars *f* of the frame F, the cylinders of the two jacks being connected with a single pump *m*, so that the said jacks may be operated in unison. In order to allow the frame F to yield downwardly upon striking an obstruction, either an elastic fluid can be used in the hydraulic jacks or a cylinder *m'*, having a spring-held plunger m^2, constituting an accumulator, may be connected with the pipes running from the pumps to the jacks. The said spring will allow the plunger to yield upward, and consequently will allow the frame F to swing downward on striking an obstruction. It is obvious that screws or other means of adjustment may be substituted for the jacks.

The cutting-chains H may be operated in any desired manner. A convenient means for operating them is an electric motor N, mounted upon the frame A and connected by a sprocket-chain *n* with a sprocket-gear *n'* upon the shaft D, the sprocket-gear *n'* being preferably small enough to operate within the shield, so that the latter need not be cut away to receive it. The shaft D is connected with the shaft G, as by sprocket-wheels n^2 and n^3, over which runs a sprocket-chain n^4. The sprocket-wheel n^3 is preferably of larger diameter than the sprocket-wheel n^2 to increase the power applied to the upper shaft. The sprocket-wheels carrying the cutter-chains upon the lower shaft are preferably loose, so that the chains are driven by the upper shaft, and such upper shaft is preferably revolved in such direction as to pull the chains upwardly over the shield, as this arrangement causes the tight laps of the chains to do the cutting.

A hopper O preferably extends across the frame A beneath the rearward portions of the peripheries of the wheels H, and such hopper is provided with a shaft which may be driven from the motor-shaft and which is provided with two screw conveyers leading from the outer limits of the hopper toward an intermediate point, at which point an opening is provided, so that the coal may fall into a chute P below the latter and containing a screw conveyer *p*, and that extends upwardly and rearwardly to a considerable height above the bottom of the gangway. The outer and rear end of the chute P carries a double spout Q, which is pivoted, so that either end thereof can be depressed, thus providing for the discharge of the coal carried by the conveyer into either of two mine-cars R behind the machine. In order to move the machine laterally upon its axles, hydraulic jacks S, one or more, preferably two, are secured to each side beam *a* and all the jacks upon each side are connected, so that they may be operated in unison, if desired.

In order to hold the rear wheels upon the ground, the cutters having a tendency to raise the rear end of the machine, uprights T are provided at the rear ends of the side beams *a*, and each of said uprights carries a cylindrical socket *t*, having within it a spring *t'*, upon which rests a hollow plunger t^2, whose upper end supports a nut t^3, and a threaded shank t^4 of a yoke engages said nut and extends through the said plunger, the yoke supporting one end of an axle t^5, whose opposite end is supported in the opposite yoke, and the said axle is provided with wheels t^6, one in each of the said yokes, the said wheels being adapted to rest against the roof of the gangway, and thus to prevent the rear end of the frame A from rising. The springs *t'* permit the wheels t^6 to yield to accommodate any irregularities in the roof. In order to feed the cutters forward, a hydraulic-jack cylinder U is swiveled to the rear end of each side beam *a* or other convenient portion of the machine, and the jack-piston *u* is sharpened at its outer end to engage the wall of the gangway. The hydraulic jacks U are operated by pumps *u'*. Valves are of course placed in the pipes of all the hydraulic jacks, so that the liquid pumped can be held or released, as desired.

In the operation of my machine the machine is placed with its chains opposite the head of the gangway. The frame F is adjusted to such an inclination as will cause the upper limit of the travel of the cutters to be that of the height desired for the gangway. The hydraulic jacks at the sides of the machine are operated to cause one of the outer chains—for instance, the left-hand one, as seen in Fig. 1—to operate in a plane as far to the left as may be necessary to cut a clearance for the left-hand wheels C. The machine is then fed forward by means of the hydraulic jacks U, whose pointed pistons are caused to engage the walls of the heading until the cutters have cut channels into the head of the gangway as deep as the shield will permit. During this cutting operation the wings on the cutting-chains carry the coal which is cut upward along the shield, the sides of the channels in the coal serving to keep the coal which has been cut in the field of operation of the wings, and the coal thus carried up drops from the upper end of the shield into the hopper O, where the screw conveyers carry it to the opening, through which it falls into the chute P. The coal is then carried up through the chute P and is deposited into one or the other of the cars R, according as

the spout Q is tipped one way or the other. When the channels have been cut as deeply as the shield will permit, the whole machine is moved bodily on the axles B by means of the hydraulic jacks S until the coal between the channels has been cut away, so that the entire head of the gangway is removed to the depth of the channels. The machine is then preferably restored to its previous lateral position, and the operation repeated, although the channels may be cut in the second lateral position of the machine and the material between the channels removed by a lateral movement, the reverse of that previously described. The height of the heading cut by the machine can be varied within wide limits by altering the inclination of the frame F. The machine can be caused to curve the heading laterally by operating one of the hydraulic jacks U more than the other, and the machine can be caused to curve the heading vertically upward or downward by raising or lowering the rear end of the frame A by means of the screws a^3.

As illustrated in Fig. 6, instead of cutter-chains disks or cylinders may be used and for convenience the motor for driving the same may be mounted on the frame F′, by which the disk-carrying shafts are supported, the said frame being adjusted by a screw G*, which can be operated to raise and depress the said frame, the said frame swinging upon a shaft H′ as a fulcrum. The shield I′ is keyed to the shaft upon which the cutting-disks are mounted and revolves with the same, wings K′ being mounted upon the said shield for carrying the cut coal upward, the coal being discharged into a hopper similar to the hopper O, before described, and being carried away by a screw conveyer K^2, similar to the screw conveyer before described. As illustrated in Figs. 7, 8, and 9, the shield may be made to serve the purpose of the lower sprocket-wheels, the shield being curved to support the lower bite of the sprocket-chains, and screw conveyers L′ may be mounted within the shield beneath each cutting-chain to carry upward the coal cut, the latter falling through openings K^3 in the shield to reach the conveyer or flight conveyers, or other form of conveyers may be similarly mounted.

It is obvious that various changes can be made in the above-illustrated construction without departure from the spirit of my invention. For instance, the chains could be caused to cut so that the channels formed would be horizontal or they could be caused to cut so that the channels formed are inclined to the horizontal or the motion may be such that the chains are caused to cut with a downward pull. A rotary cutter could be substituted for the chains, so that instead of cutting a channel a cut circular in side elevation would be formed, and the desired width of the heading could be obtained by moving said cutter laterally.

Having thus described my invention, what I claim is—

1. In a machine for cutting headings, the combination of a cutter adapted to cut a channel transverse to the machine, which channel shall be as long as the corresponding transverse dimension of the machine, and means for moving said cutter laterally to widen said channel.

2. In a machine for cutting headings, the combination of a cutter, means for causing said cutter to cut a channel as long as the transverse dimension of the machine in the direction of the channel, and means for moving said cutter laterally to widen the channel.

3. In a machine for cutting headings, the combination of a cutter, means for causing said cutter to cut a channel as long as the transverse dimension of the machine in the direction of the channel, and means for moving said cutter laterally throughout the length of said channel to widen the same.

4. In a machine for cutting headings, the combination of a cutter, means for causing said cutter to cut a vertical channel equal in length to the height of the heading, and means for moving said cutter laterally throughout the length of said channel to widen the same.

5. In a machine for cutting headings, the combination of a series of cutters, means for causing said cutters to cut channels as long as the corresponding transverse dimension of the machine, forward of the framework of the machine, and means for moving said cutters laterally to remove the material between said channels.

6. In a machine for cutting headings, the combination of supports, cutting devices mounted on and adapted to cut forward of said supports for a distance equal to the corresponding transverse dimension of the machine, and means for shifting said cutting devices bodily on said supports in a direction transverse to the direction of motion of said cutting devices.

7. In a machine for cutting headings, the combination of a series of cutters, means for causing said cutters to cut parallel channels as long as the dimension of the machine in the direction of the channels, and means for moving said cutters laterally throughout the length of said channels to widen the same.

8. In a machine for cutting headings, the combination of a series of cutters, means for causing said cutters to cut vertical channels equal in length to the height of the heading, and means for moving said cutters laterally throughout the length of said channels to widen the same.

9. In a machine for cutting headings, the combination of a series of cutters adapted to cut parallel grooves forward of the frame-

work of said machine, and means for moving said cutters laterally a distance equal to the distance between two adjacent grooves.

10. In a machine for cutting headings, the combination of a series of cutters adapted to cut parallel grooves from one transverse limit of the heading to the opposite wall thereof, and means for moving said cutters laterally a distance equal to the distance between two adjacent grooves.

11. In a machine for cutting headings, the combination of a series of cutters adapted to cut equidistant parallel grooves from the top to the bottom of the heading, and means for moving said cutters laterally a distance equal to the distance between two adjacent grooves.

12. In a machine for cutting headings, the combination of a series of cutting-chains forward of the framework of said machine, means for causing said chains to cut parallel channels, and means for moving said chains laterally in said channels to remove the material between the latter.

13. In a machine for cutting headings, the combination of a pair of parallel shafts, sprocket-wheels on the ends of said shafts and at intermediate points thereon, sprocket-chains passing over the said wheels and carrying cutters, means for driving said wheels, and means for moving said shafts longitudinally of themselves.

14. In a machine for cutting headings, the combination of a frame, cutters mounted on said frame, and means for advancing said frame in the heading at various angles to the direction of such heading, whereby headings of various dimensions may be cut with the same frame.

15. In a machine for cutting headings, the combination of a body, a frame pivoted thereto, cutters mounted on said pivoted frame, and means for yieldingly maintaining said pivoted frame at a desired elevation.

16. In a machine for cutting headings, the combination of a body, a frame pivoted thereto, cutters mounted on said pivoted frame, and means for yieldingly maintaining said pivoted frame at a desired elevation, said means consisting of a hydraulic jack having an accumulator in connection therewith.

17. In a machine for cutting headings, the combination of a frame provided with cutters from one end to the other thereof, said cutters being exposed for cutting throughout the length of said frame and means for advancing said frame in the heading at various angles to the direction of such heading, whereby headings of various dimensions may be cut with the same frame.

18. In a machine for cutting headings, the combination of supports for such machine, a swinging frame, shafts carried in the ends of said frame, sprocket-wheels carried by said shafts, cutting-chains carried by said sprocket-wheels, said cutting-chains being exposed for cutting throughout the length of said frame and means for moving said parts, except said supports, longitudinally of said shafts.

19. In a machine for cutting headings, the combination of a swinging frame, shafts carried in the ends of said frame, sprocket-wheels carried by said shafts, cutting-chains carried by said sprocket-wheels, and means for moving said shafts longitudinally of themselves.

20. In a machine for cutting headings, the combination of a wheeled frame, a frame pivoted to the forward end of said first-mentioned frame, shafts carried by the upper and lower ends of said frame and extending laterally beyond the limits of said first-mentioned frame, and cutting-chains passing about said shafts.

21. In a machine for cutting headings, the combination of a wheeled frame, a frame pivoted to the forward end of said first-mentioned frame, shafts carried by the upper and lower ends of said frame and extending laterally beyond the limits of said first-mentioned frame, cutting-chains passing about said shafts, and means for moving said frames in a direction substantially parallel to said shafts.

22. In a machine for cutting headings, the combination of a car-body, means for shifting said car-body laterally upon its axles, a frame pivoted to the forward end of said car-body, means for raising and lowering said pivoted frame, shafts carried by the upper and lower ends of said frame, sprocket-wheels on said shafts, and sprocket-chains carried by said wheels, said chains being provided with cutters.

23. In a machine for cutting headings, the combination of a car-body comprising parallel side beams, axles supporting said side beams, wheels on said axles adjacent to said side beams, all of said wheels being upon the same relative side of their respective side beams, means for moving said car-body laterally upon said axles, said axles extending beyond said frame in the direction of the sides of said side beams opposite to said wheels, a frame pivoted to the forward ends of said side beams, shafts carried by said frame, sprocket-wheels upon the outer ends of said shafts and at intermediate points thereon, cutters carried by said sprocket-chains, and means for raising and lowering said pivoted frame.

24. In a machine for cutting headings, the combination of a series of parallel cutters, a shield between but back of the extreme range of said cutters, and means for moving said cutters in the direction of their reach and laterally thereof.

25. In a machine for cutting headings, the combination of a car-body comprising parallel side beams, axles supporting said side beams, wheels on said axles adjacent to said

side beams, all of said wheels being upon the same relative side of their respective side beams, means for moving said car-body laterally upon said axles, said means consisting of hydraulic jacks mounted on said side beams and having their plungers directed toward the side walls of the heading, said axles extending beyond said frame in the direction of the sides of said side beams opposite to said wheels, a frame pivoted to the forward ends of said side beams, shafts carried by said frame, sprocket-wheels upon the outer ends of said shafts and at intermediate points thereon, cutters carried by said sprocket-chains, and means for raising and lowering said pivoted frame.

26. In a machine for cutting headings, the combination of a series of cutters adapted to cut channels, a shield between said cutters, and extending transversely to the direction of feed of the cutters in cutting the said channels, and means for feeding said cutters in the direction of the plane of the shield, whereby the shield may be in contact with the uncut surface of the heading during said lateral feed.

27. In a machine for cutting headings, the combination of a series of cutters adapted to cut channels, a shield between said cutters and extending transversely to the direction of feed of the cutters in cutting the said channels, means for feeding said cutters in the direction of the plane of the shield, whereby the shield may be in contact with the uncut surface of the heading during said lateral feed, and wings on said chain to carry away the cut material.

28. In a machine for cutting headings, the combination of a series of cutters adapted to cut channels, a shield between said cutters, and wings adapted to engage the material cut by said cutters and confined by said shield, and to convey said material away.

29. In a machine for cutting headings, the combination of a car-body having a frame pivoted at the forward end thereof, upper and lower shafts carried by said frame, said shafts having sprocket-wheels, sprocket-chains passing over said sprocket-wheels, said sprocket-chains having lateral wings or cutters, and a shield beneath and supporting said sprocket-chains.

30. In a machine for cutting headings, the combination of a frame having upper and lower shafts, sprocket-wheels upon such shafts, sprocket-chains passing about said sprocket-wheels and provided with cutters, a shield beneath and supporting said sprocket-chains, and a lateral guide or rib on said shield for said chains.

31. In a machine for cutting headings, the combination of a car-body, sprocket-chains at the forward end of said body, said chains moving upward during the cutting operation, a shield beneath said chains, wings on said chains, whereby the coal that is cut is carried upward, a hopper to receive the coal carried up by said wings, said hopper having oppositely-feeding conveyers therein to convey the coal to a central point, and a conveyer directed upwardly and rearwardly that is adapted to receive said coal.

32. In a machine for cutting headings, the combination of a car-body, sprocket-chains at the forward end of said body, said chains moving upward during the cutting operation, a shield beneath said chains, wings on said chains, whereby the coal that is cut is carried upward, a hopper to receive the coal carried up by said wings, said hopper having oppositely-feeding conveyers therein to convey the coal to a central point, and a conveyer to receive the coal at such point and directed upwardly and rearwardly to deposit the coal in a car, said conveyer being provided with a pivoted spout.

33. In a machine for cutting headings, the combination of a car-body, sprocket-chains at the forward end of said body, said chains moving upward during the cutting operation, a shield beneath said chains, wings on said chains, whereby the coal that is cut is carried upward, a hopper to receive the coal carried up by said wings, said hopper having oppositely-feeding conveyers therein to convey the coal to a central point, and a conveyer to receive the coal at such point and directed upwardly and rearwardly to deposit the coal in a car, said conveyer being provided with a pivoted spout, having two opposite discharge-openings, whereby the coal can be discharged into either of two cars that are beside each other.

34. In a machine for cutting headings, the combination of a car-body, cutters mounted upon the forward end of said car-body, and yielding means carried by the rearward end of said car-body to engage the roof of the heading and prevent said end from being raised.

35. In a machine for cutting headings, the combination of a car-body, upwardly-moving cutters mounted upon the forward end of said car-body, and yielding means carried by the rearward end of said car-body to engage the roof of the heading and prevent said rearward end from being raised.

36. In a machine for cutting headings, the combination of a car-body provided with cutting mechanism at its forward end, wheels rearward of said cutting mechanism, but near the forward end of the machine, wheels at the rearward end of the machine, means for raising and lowering said car-body upon said last-mentioned wheels and yielding means carried by said car-body to engage the roof of the heading and prevent said rearward end from being raised by the action of the cutting mechanism.

37. In a machine for cutting headings, the

combination of a car-body having a cutter at the forward end thereof, propelling means engaging the opposite walls of the heading, separate propelling means carried by the rear end of the car-body, and means for independently operating each of said separate means for propelling.

38. In a machine for cutting headings, the combination of a car-body having wheels at its forward and rear ends, cutters mounted upon the forward end of said car-body, the forward wheels of the car-body being located rearward of the cutters, and yielding means carried by the rearward end of said car-body to engage the roof of the heading and prevent said end from being raised.

39. In a machine for cutting headings, the combination of a car-body having wheels at its forward and rear ends, cutters mounted upon the forward end of said car-body, the forward wheels of the car-body being located rearward of the cutters, and yielding means carried by the rearward end of said car-body to engage the roof of the heading and prevent said end from being raised, said yielding means consisting of wheels on a spring-supported axle.

40. In a machine for cutting headings, the combination of a car-body, having a cutter at the forward end thereof, means for rotating said cutter and propelling means engaging the opposite walls of such heading, said propelling means being capable of actuation separately from each other, whereby the machine may be made to change its direction of cutting.

41. In a machine for cutting headings, the combination of a car-body having a cutter at the forward end thereof, and separate propelling means engaging the opposite walls of the heading, such means consisting of hydraulic jacks having plungers which are adapted to engage the said walls.

42. In a machine for cutting headings, the combination of a car-body having a cutter at the forward end thereof, of hydraulic jacks swiveled at the rear end of such body, one on each side thereof, said jacks having sharpened plungers that are adapted to engage the walls of the heading.

43. In a machine for cutting headings, the combination of a car-body having a cutter at the forward end thereof, means for rotating said cutter, and propelling means engaging the opposite walls of such heading, said propelling means being capable of actuation separately from each other, and separately from said means for rotating said cutter, whereby the machine may be made to change its direction of cutting.

In testimony that I claim the foregoing I have hereunto set my hand.

WILLIAM ARTHUR LATHROP.

Witnesses:
EDMUND P. COTTLE,
HARRIET E. LATHROP.