No. 619,907. Patented Feb. 21, 1899.

A. RAKY.

BORING APPARATUS FOR DEEP BORINGS.

(Application filed Apr. 10, 1897.)

(No Model.)

2 Sheets—Sheet 1.

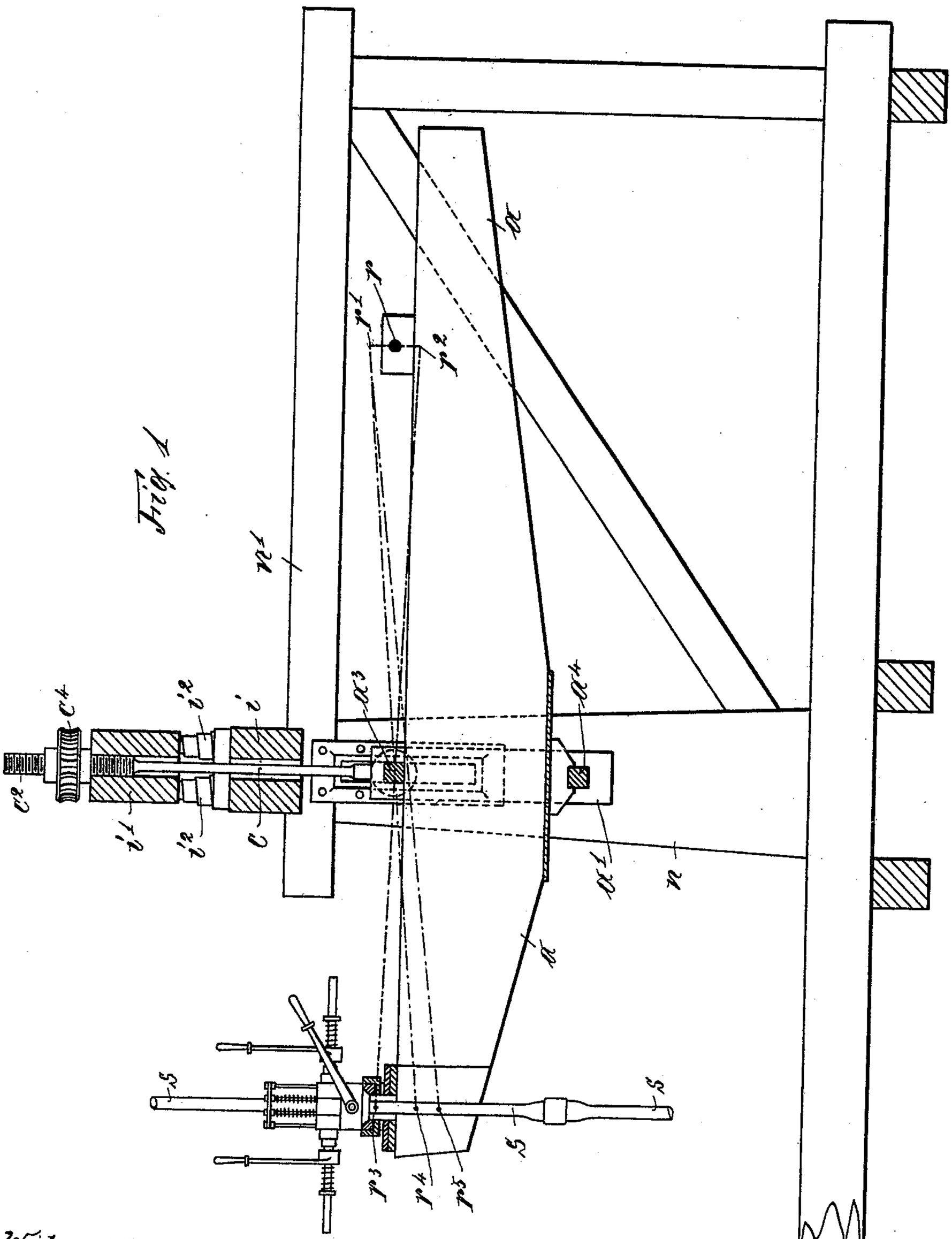

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Fig. 3.

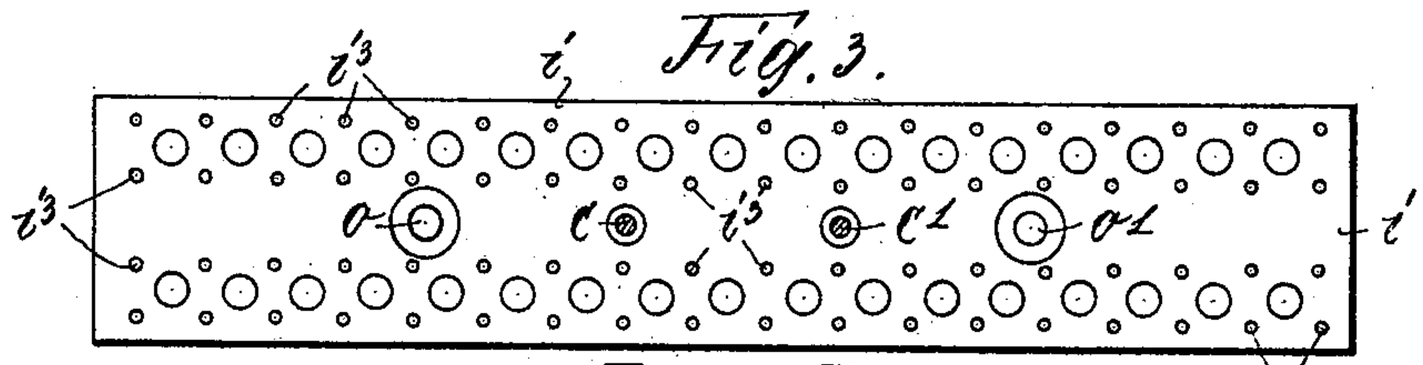
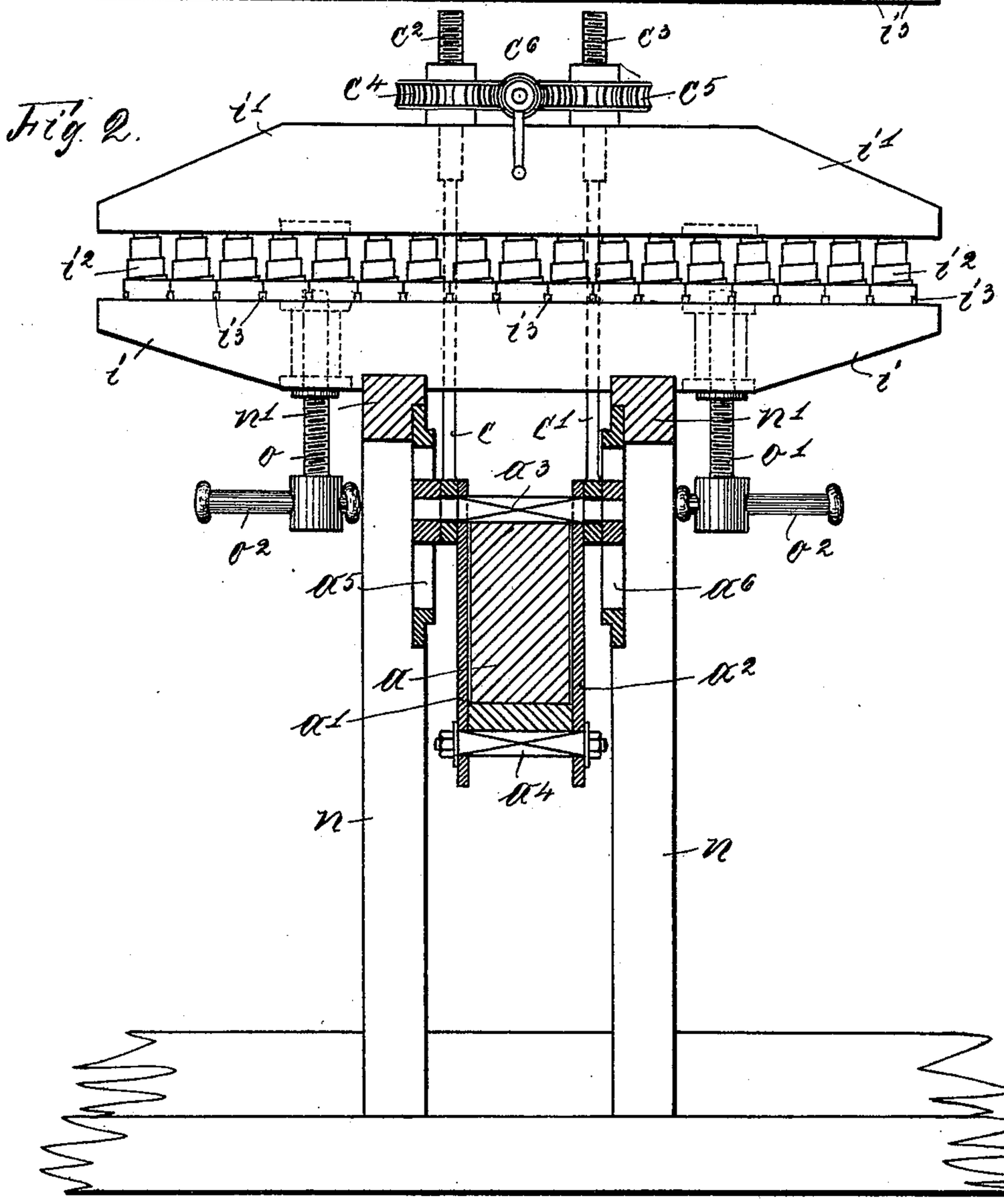


Fig. 2.



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UNITED STATES PATENT OFFICE.

ANTON RAKY, OF RUPPRECHTSAU, GERMANY.

BORING APPARATUS FOR DEEP BORINGS.

SPECIFICATION forming part of Letters Patent No. 619,907, dated February 21, 1899.

Application filed April 10, 1897. Serial No. 631,609. (No model.)

To all whom it may concern:

Be it known that I, ANTON RAKY, a subject of the King of Prussia, German Emperor, and a resident of Rupprechtsau, near Strasburg, Alsace, in the German Empire, have invented certain new and useful Improvements in Boring Apparatus for Deep Borings, (for which patents have been obtained in Germany, No. 91,366, dated August 2, 1896, and in Switzerland, No. 12,891, dated August 5, 1896,) of which the following is an exact specification.

This invention refers to boring apparatus for deep borings of the kind in which the rods are suspended from one end of a horizontal double-armed lever or oscillating beam, the other end of which is acted on by an engine or motor. The power of the latter has up to now been transmitted to said oscillating beam not directly—*i. e.*, not directly from the piston-rod of the cylinder of an engine or motor—but a pulley, rope-disk, or chain-wheel driven by the engine or motor was connected to another pulley, rope-disk, or chain-wheel by a belt, rope, or chain, and a crank connected to the said beam by means of a connecting-rod was rotated by the shaft of said second pulley, &c., so as thereby to produce the oscillations of the beam. The driving mechanism just mentioned was combined with a slackening mechanism for the belt, &c. This mechanism caused the oscillating beam to be disconnected from said belt on the rods commencing their downward way, and there resulted thus a free fall of the rods, as well as of the monkey and the chisel. In consequence of said disconnection being best attainable if the beam is operated by the mediation of a belt (or rope or chain) and in consequence of the free fall of the monkey and the chisel having up to now been considered as very essential for the effect of the apparatus there has but seldom been made a trial of dispensing with the slackening device (although this latter gives easily rise to troubles) and of operating the oscillating beam in another or more direct manner.

The oscillating beam is in some cases supported elastically or by springs, respectively. Now it has not been perceived up to now that this elastic support may very well be employed for the objects in question—*i. e.*, for doing away with the slackening device and for driving the oscillating beam on a more direct way instead of letting it be driven by the mediation of a belt, &c., as required by said device. To employ said elastic support for said objects, the strength of the springs forming the said support must be kept in a certain proportion to the weight of the rods, (of course in any case, together with the monkey and chisel, and when speaking of "rods" in the further course of this specification I mean by that term the monkey and the chisel, too,) preferably in such a measure that the strength of said springs corresponds to about double the weight of the rods. It is to be borne in mind that the weight of the rods increases correspondingly to the increase in depth of the borehole. If, therefore, the proportion mentioned shall be maintained, the arrangement must be such that the strength of the springs can be increased according to the increase in the weight of the rods. In other words, one must be able to regulate the tension of the springs (or other elastic or yielding means that support the beam or the axle of the same, respectively,) according to the weight of the rods. As to the other elastic or yielding means just mentioned in the parentheses I wish it to be understood that the springs spoken of up to now may well be replaced by an equivalent means—for instance, by air. There is no difficulty whatever in supporting the beam or the axle of the same, respectively, by two or more air-cylinders—*i. e.*, by the pistons or piston-rods of the same. To make up for the increase in weight of the boring-rods, the tension or compression of the air need simply be correspondingly increased by further compressing it. It will be clear to any expert that such a higher compression may be produced in a very simple way. My invention does not reside in supporting the beam elastically, but in making the elastic supporting means regulable according to the weight of the rods, as aforedescribed. By making use of such an arrangement I am not any more compelled to operate the beam by aid of a crank and connecting-rod; but I may operate it directly from the piston-rod of the engine or motor used for the respective plant. On the whole, by employing my novel arrangement I make the apparatus entirely in-

dependent of any distinct driving device. It is, however, a matter of course that the driving device chosen should be made suitable to the special requirements of a boring apparatus for deep borings.

In order to make my invention more clear, I refer to the accompanying drawings, in which—

Figure 1 is a side view of my improved boring apparatus, partly in section. Fig. 2 is a front view of the same, also partly in section; and Fig. 3 is a plan of the cross-beam *i*, Figs. 1 and 2.

The oscillating beam *a* is in its middle portion encompassed by the two side plates a' a^2, the upper cross-bolt a^3, (forming the axle of the beam,) and the lower cross-bolt a^4. The projecting ends of the upper cross-bolt or axle a^3 take through eyes of two vertical rods c c', that pass through the lower cross-beam *i* and through the upper cross-beam i'. The cross-beam *i* carries the springs i^2. The cross-beam i' is carried by said springs. The upper ends of the rods c c' are formed into or provided with screw-threaded spindles c^2 c^3, which in their turn are provided with and held by worm-wheels c^4 c^5. The latter may be rotated at any time by means of a worm c^6, arranged between them. One of said spindles c^2 c^3 is provided with a right-handed thread, the other with a left-handed thread, and the beam is thus raised or lowered when the worm c^6 is turned in one or the other direction. The ends of the axle a^3, projecting over the eyes of the rods c c', are furnished with guide-blocks reciprocating vertically in guides a^5 a^6.

As shown in Figs. 2 and 3, each of the springs i^2 is located between a few short pins or projections i^3 in such a manner that it may be removed from its place or inserted between the two cross-beams, or exchanged, respectively. I have shown the cross-beam *i* completely covered with springs; but this is the case only when the greatest depth of the bore-hole or the greatest weight of the rods has been nearly reached. Prior thereto there are less springs upon the beam *i* or between the beams i i', respectively. n' are horizontal beams supporting the cross-beam *i*, and *n* are vertical beams supporting the front ends of the horizontal beams n' and having the guide-pieces a^5 a^6 secured to them. When a rod is added to the rods—in other words, when the weight of the rods is increased by that of a rod—then two or more springs (according to the proportion of the strength of a spring to the weight of a rod) are added to those already being between the beams i i', so as to make up for said increase in weight.

When springs are to be inserted between the beams i i' or between the pins i^3, respectively, they may either be compressed by any suitable means in a measure corresponding to the height of said pins and may then be put in their compressed state between said beams or the upper cross-beam may be raised for a way also corresponding to the height of the said pins. Raising said beam may be effected by any desired means—for instance, by screw-spindles o o', taking through the lower cross-beam and having displaceable handles o^2, by which they may be turned. The manner of operation of said spindles will certainly be clear without a special description, wherefore I abstain therefrom; but I wish it to be understood that I do not limit myself to raising the beam i' only by means of the said spindle, because the latter may well be replaced by any other suitable device.

The manner of operation of the whole apparatus is as follows: Suppose power be applied to the point *r*, Fig. 1, of the beam and said point be reciprocated vertically for the way indicated by the short vertical line r' r^2. Then the head of the beam or the rods *s*, respectively, pass through the way r^3 r^4. The beam oscillates thus upon the axle a^3; but this latter remains stationary—*i. e.*, is not lowered—in consequence of the strength of the springs i^2 corresponding to about double the weight of the rods *s*. If, however, the speed of the engine or motor is increased, and if therefore the number of oscillations of the beam *a* is correspondingly increased, (preferably up to sixty oscillations per minute,) then the *vis viva* of the descending rods will become so great as to overcome the strength of the springs i^2. The *vis viva* of the rod is transmitted to the springs by the beam *a*, the axle a^3, the rods c c' with their threads c^2 c^3, the worm-wheels c^4 c^5, and the cross-beam i'. In consequence of said increase of the *vis viva* of the rods the springs are compressed at every descent of the rods *s*, and the axle a^3 is thus lowered for a corresponding way. This results in the way of the head of the beam getting elongated down to r^5. In other words, the point r^3 does not any more get down to the point r^4 only, but to the point r^5. As long as the rods move through a way corresponding to the line r^3 r^4 the chisel does not touch the bottom of the bore-hole or does not strike upon the bottom, respectively; but this occurs as soon as the speed of the apparatus is increased in the measure aforedescribed. Thus in spite of the apparatus having no means for causing a free fall of the rods the chisel can strike powerfully upon the bottom of the boring-hole. In the moment following that in which the chisel performs its work the springs are relieved from the *vis viva* of the rods, and they are thus enabled to draw the rods *s* upward for a way corresponding to the line r^5 r^4. The rods are then further lifted by the engine or motor in the normal manner.

Having thus fully described the nature of this invention, what I desire to secure by Letters Patent of the United States is—

In a boring apparatus for deep borings, having an oscillating beam adapted to carry the rods at one of its ends, and to be acted on by the driving power at its other end, and hav-

ing an elastic support that is put under tension by the weight of the rods, the combination with the latter and with the rods, of springs for maintaining the tension of said support, pins located upon the under cross-bar and serving as guides for the springs, the said springs being arranged in such manner, that in accordance with the increase of the weight of the rods the number of springs in action may be correspondingly varied, for the purpose and substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ANTON RAKY.

Witnesses:
GUSTAV TAUBE,
WILLIAM ESSEMSEIN.