No. 652,692.

Patented June 26, 1900.

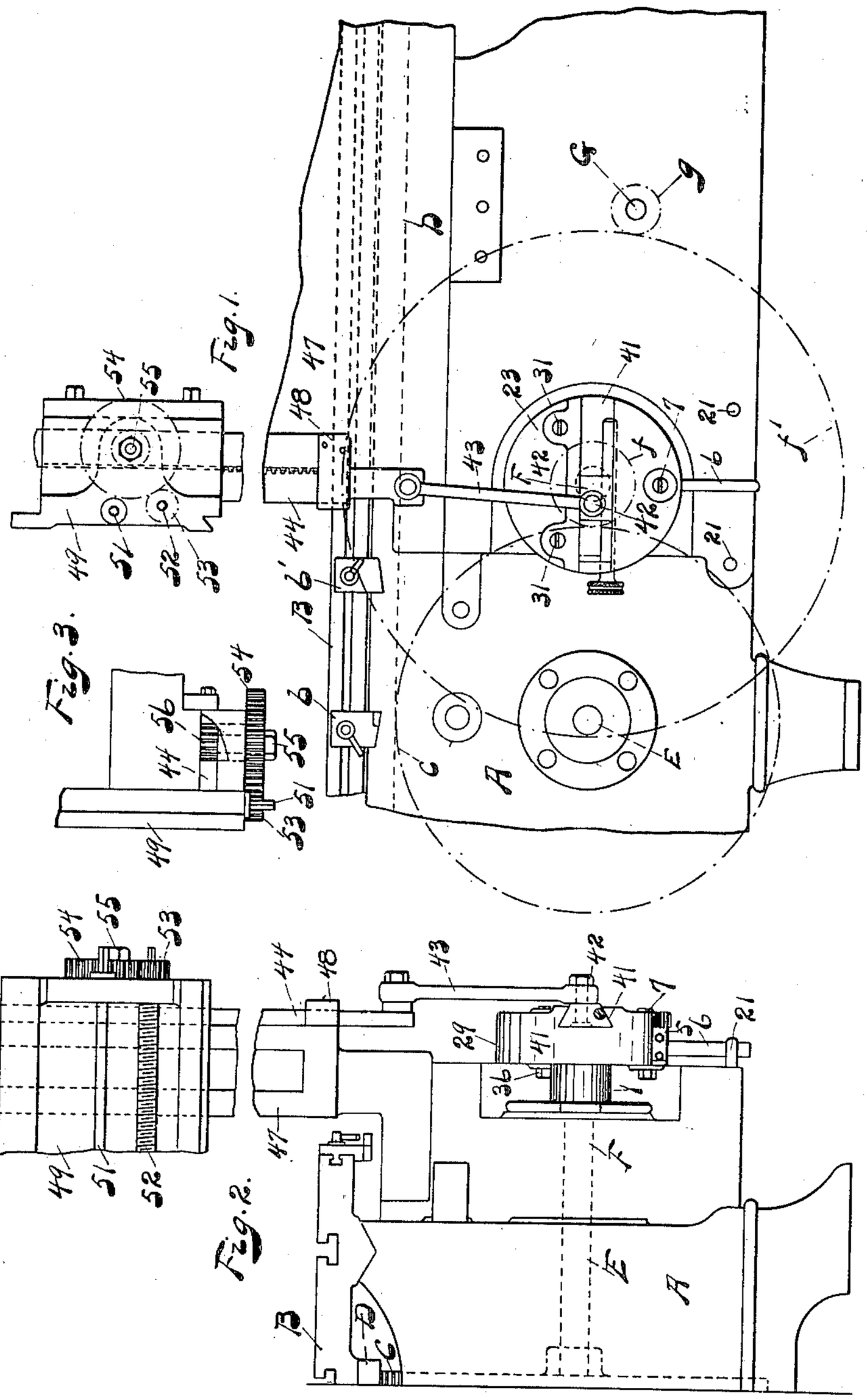
A. E. ROBINSON.

CLUTCH.

(Application filed Dec. 20, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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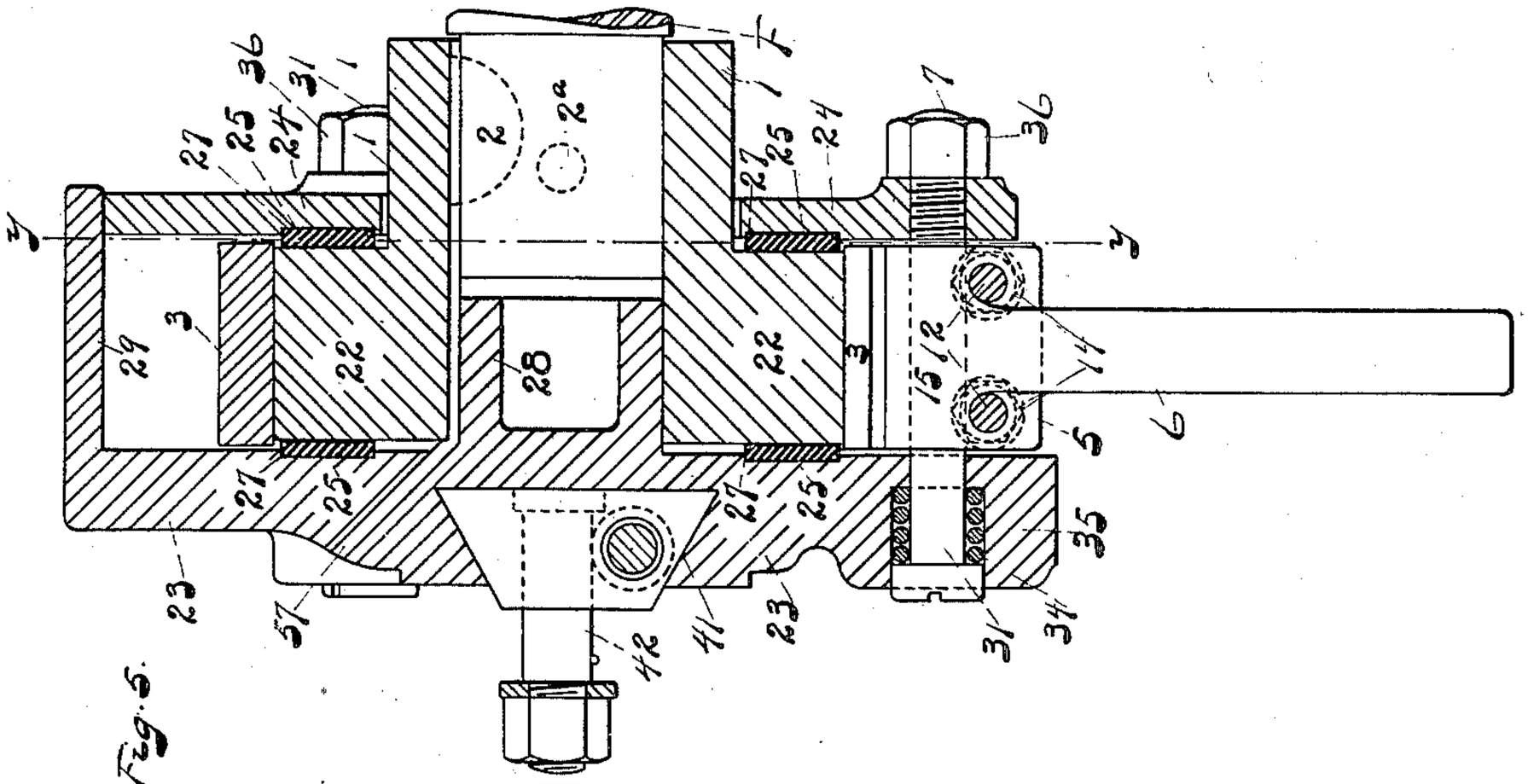

Fig. 5.

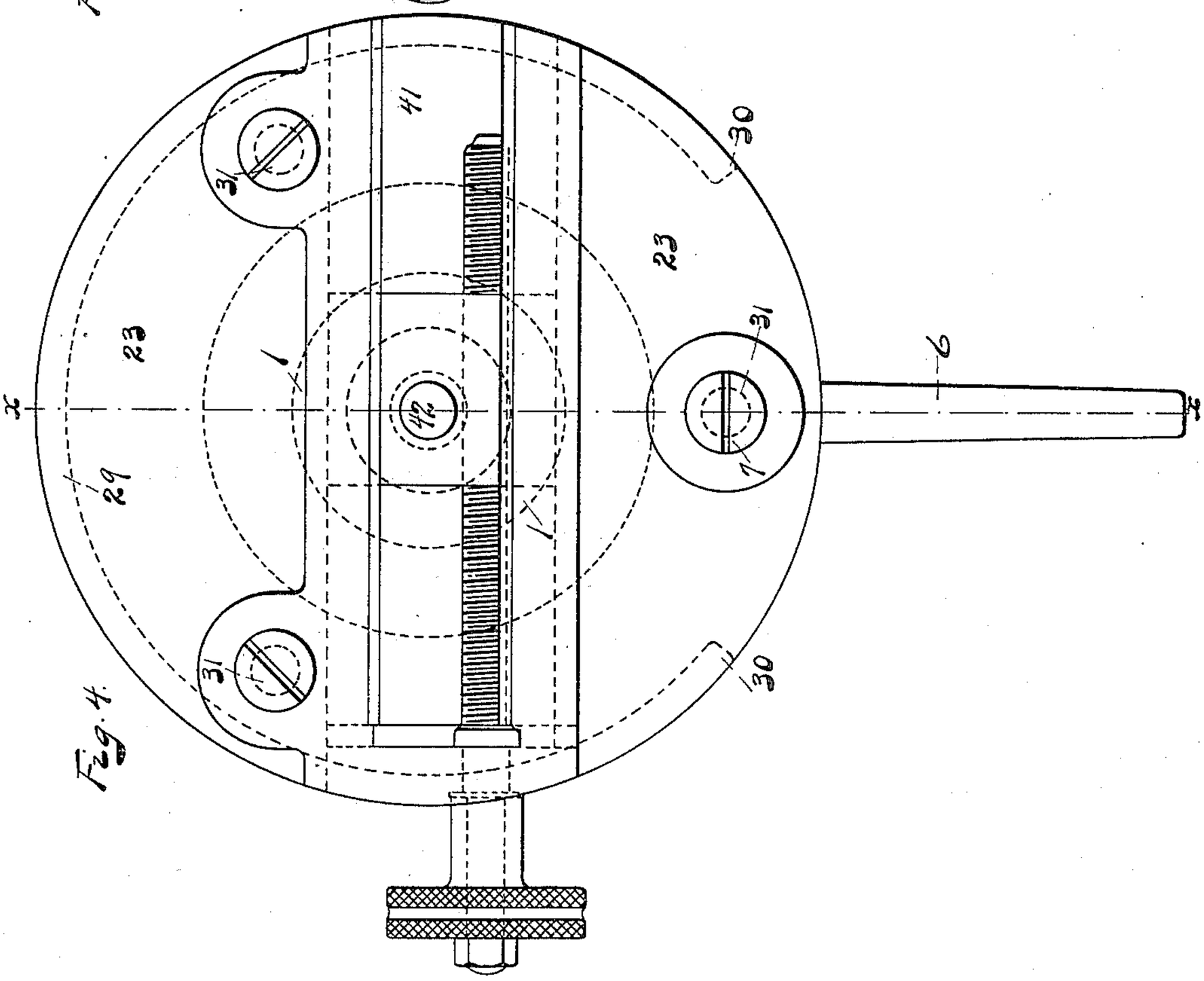

Fig. 4.

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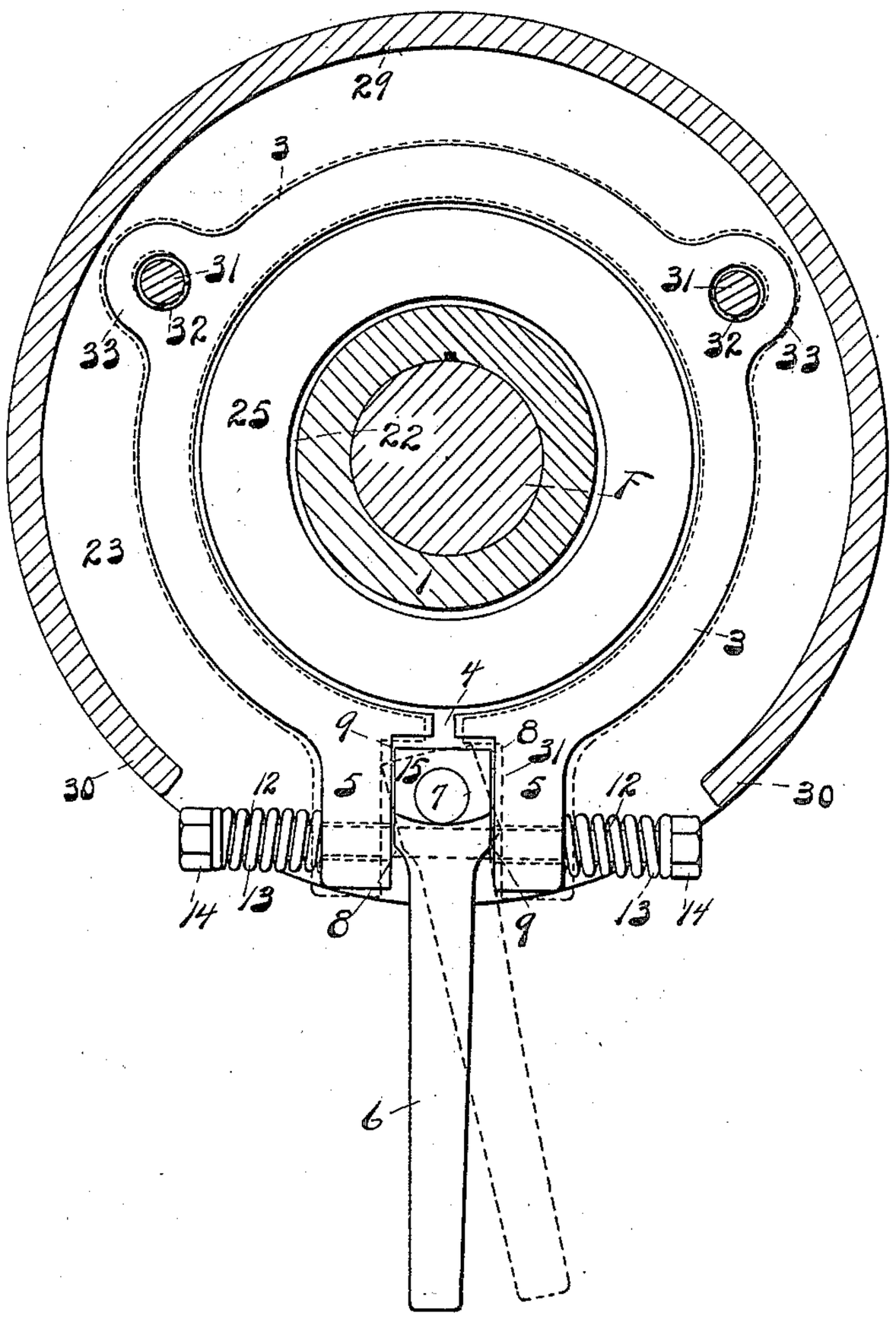
(No Model.) 3 Sheets—Sheet 3.

Fig. 6.



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UNITED STATES PATENT OFFICE.

ALBERT E. ROBINSON, OF COVINGTON, KENTUCKY, ASSIGNOR TO THE AMERICAN TOOL WORKS COMPANY, OF CINCINNATI, OHIO.

CLUTCH.

SPECIFICATION forming part of Letters Patent No. 652,692, dated June 26, 1900.

Application filed December 20, 1899. Serial No. 741,021. (No model.)

To all whom it may concern:

Be it known that I, ALBERT E. ROBINSON, a citizen of the United States, residing at Covington, in the county of Kenton and State of Kentucky, have invented a certain new and useful Improvement in Clutches, of which the following is a specification.

My invention relates to that class of clutches adapted principally for transmitting intermittent motion, and is especially useful as applied in connection with the feeding agencies of so-called "metal planing and shaping machines."

The object of my invention is to provide a device that will be positive in its action on the parts to be moved while the movement of those parts is desired, but relieved of shock and abrasive grinding or wearing action during the operation of the machine while the movement of those parts is not desired.

My invention consists in providing a clutch embodying a primary or main clutching device adapted to transmit motion to the part or object to be moved and an auxiliary clutching device adapted to hold the primary clutching device out of positive engagement with relation to the prime mover.

It consists, further, in providing a clutch comprising a member adapted to be revolved alternately in a certain and in the reverse direction during limited times, a clamp adapted to make temporary engagement with the moving member, so as to be carried thereby, a part for temporarily relieving the engagement between the clamp and moving member, and a part for maintaining the clamp in relieved relation to the moving member; further, in so constructing and arranging those parts that the reversal of movement of the moving part will cause the clamp and moving part to interengage, so as to travel together, and, further, in the parts and in the construction, arrangement, and combinations of parts hereinafter more fully described and claimed.

I have shown and described my device in connection with the feeding agency of a so-called "metal-planing" machine for feeding the tool head or slide with relation to the work, although it is obvious that the same may also be used in connection with other machines and devices, such as metal-shaping machines and others of the same or different character. Heretofore in devices of this character the parts that were used to maintain the moving parts in operative relation to perform their duty were also depended upon to bring those parts out of operative relation, resulting in excessive abrasion and wear of the contact-faces and chattering shock and breakage of the parts, soon rendering the whole device useless, until it had been repaired, often causing serious delays and damage. I overcome the objections to the devices heretofore in use in a novel, effective, and inexpensive manner.

In the drawings, Figure 1 is a side elevation of so much of a metal-planing machine with my improved device applied thereto as may be necessary to illustrate my invention as applied to a machine of this character. Fig. 2 is an end elevation of the same, and Fig. 3 is a plan view of a detail of a machine of the character described, showing the rack-and-gear connections for operating the tool head and slide. Fig. 4 is a front elevation of my improved device. Fig. 5 is a central section of the same on the line $x\,x$ of Fig. 4; and Fig. 6 is a section of the same on the line $y\,y$ of Fig. 5, also showing the clamping-ring and connected parts in released position in dotted lines.

A represents a frame of a metal-planing machine on which a work-holding table B is given a reciprocating motion in the usual manner, as by means of a bull-wheel C, meshing with a rack D on the bottom of the table. The bull-wheel C may be mounted on a shaft E and receives motion through suitable pinion f on a shaft F, which may also carry a gear f', meshing with a pinion g on a shaft G, carrying tight and loose pulleys rotated from a straight and a twisted belt in the ordinary and well-known manner to give the operating-shafts and the table the reciprocating motion required to bring the table with the work-support thereon backward and forward under the tool. The belts mentioned may be shipped in the usual way by the tappets $b\,b'$ on the table.

Preferably one of the shafts of the machine—as, for instance, the shaft F—has a

revoluble part or center piece 1 secured rigidly thereto, as by means of a half-moon key 2 and bolt or rivet 2ª. This center piece is the actuating member of the combination and rotates with the shaft in one direction when the tool is cutting and in the reverse direction when the parts are being operated in the reverse direction into position for a new cut by the tool. Advantage of this reciprocating motion is taken to operate the feed mechanism.

A friction-clamp band or ring 3 takes about the center piece 1 and is preferably arranged to surround the periphery of the center piece. The clamp may have an opening 4 across its width, and the ends of the clamp may each be provided with a lug or projection 5, between which a lever 6 is adapted to take. The lever is preferably pivoted on a bar or bolt 7, secured as hereinafter described. The lever may have contact-faces 8 8 9 9, adapted to take against the projections 5 5. Bolts or rods 12 take through the projections, preferably to either side of the lever, and may have springs 13 take about their ends, nuts 14 being provided to increase or decrease the tension on the springs, and thereby correspondingly vary the amount of grip exerted by the clamp 3 upon the center piece 1. I have shown the contact-faces for the lever in the form of a square head 15 for the latter. The lever 6 is adapted to be thrown to one side or the other of the radius of the center piece, thereby causing the diagonally-opposite contact-faces 8 8 or the diagonally-opposite contact-faces 9 9 to impinge against and separate the projections 5 5, thereby relieving the engagement between the clamp 3 and the center piece 1. The head or part of the lever between the projections is also preferably made somewhat smaller than the distance between the projections, so that when the clamp is gripping the center piece 1 the lever may hang loosely between the projections, so as not to interfere with the gripping of the clamp on the center piece, and for the same reason the ends of the clamp are also separated, as shown at 4.

Preferably the frame or other stationary part of the machine is provided with two stops or pins 21, against which the lever 6 is adapted to take in the manner hereinafter described.

Devices of this character as heretofore constructed embodied a center piece, a friction-ring taking thereabout, with a lever for separating the ends of the clamping-ring and a stop to each side of the lever, and I make no claim to so much of the device herein shown and described; but in this construction of the old devices the same force—namely, the frictional contact between the center piece and the clamping-ring—was depended on in connection with the stop to also keep the parts in separated relation when the lever struck either stop, causing the friction-ring to continually spring back to operative engagement with the center piece and resulting in the chattering and excessive abrasion and wear and shock and breakage of the parts heretofore mentioned. To overcome these objections, I have provided the novel, economical, and effective devices herein more fully described and claimed.

The center piece 1 has a flange 22, on either side of which are plates 23 24, with auxiliary friction devices 25 25 interposed between the flange and the respective plates. I prefer to make the plate 23 in the form of a cap or bonnet having a projecting boss or hub 28 taking into the center piece 1, which thereby forms a bearing therefor. A projecting rim or hood 29 of the cap preferably extends over the clamp to the plate 24 to form an inclosure serving to protect the parts within the same from dirt or damage. The hood 29 may terminate at 30 30 to allow for the proper operation of the lever and mechanism between the plates. The auxiliary friction devices are preferably sunk and secured in annular depressions 27 in the respective plates 23 24. The auxiliary friction devices are of inexpensive material, preferably of leather or other material adapted for the purpose and are easily replaced when worn. The plates 23 and 24 are connected by screws or bolts 31, of which I have shown three, the upper two of which also pass through clearance-apertures 32 in lugs 33 in the clamp 3. The third or lower may also serve as the rod or pivot 7 for the lever 6. Springs 34 are sunk into recesses 35 and take about the bolts 31 between the heads thereof and the plate. The other ends of the bolts are preferably tapped into the plate 24 and have nuts 36 about their ends for additional security. The springs 34 serve to draw the plates 23 24 together toward the flange 22, with the auxiliary friction devices 25 25 interposed between the flange and the respective plates to keep the metal surfaces of the flange and plates in separated relation, with the springs exerting sufficient pressure between the parts to normally carry the plates, with the center piece 1, in the movement of the latter.

When the ends of the friction-ring are partly separated by the lever, the lower part of the clearance-apertures 32 will preferably strike the bolts 31, and in the further opening of the ring the bolts 31 will act as pivots, against which the free ends of the ring will be opened, thus affording a simple and effective clearance between the center piece and the friction-ring.

In the application of my device shown herein the clutch is used to move the tool of a metal-planing machine. For this purpose the face of the plate 23 is provided with the usual cross-slot 41, in which the usual adjustable crank 42 is adapted to slide, moved longitudinally of the slot, so as to bring the adjustable crank to and from the axis of the plate to either side thereof to increase or decrease the feed, as occasion may require, or to give

the tool a forward or back feed, as may be desired. The crank 42 has the usual connecting-rod 43, connecting the crank with the usual rack 44. The rack is secured slidably with relation to the housing 47 by means of a strap 48, taking about the rack and secured to the housing. The tools are secured on suitable heads and slides mounted on a cross-rail 49, adjustable with relation to the housing and table in the ordinary and well-known way. Shafts 51 52 are for the purpose of shifting the tool-head and slide and are suitably journaled in the cross-rail and rotated in the ordinary and well-known way through a pinion 53, releasably slipped upon either screw-shaft 51 or 52 and meshing with a gear-wheel 54, mounted on a shaft 55, journaled in the cross-rail and carrying a pinion 56, which meshes with the rack 44, which latter also passes slidably through the cross-rail. The connection between the pinion 56 and shafts 51 or 52 is made in the ordinary and well-known manner by means of a ratchet-and-pawl mechanism (not shown in the drawings, because it is an ordinary and well-known device for the purpose) and is adapted to be set to rotate either shaft 51 or 52 in one direction or the other and be returned to normal position at the end of each progressive movement of either shaft without reversely rotating the shaft in its return. A suitable lubricator-passage 57 may also be provided.

The operation of my device as applied to a metal-planing machine, which will also explain its operation as applied to other uses, is as follows: When the planer is set in motion, so as to feed the table toward the rear of the housing with the tool performing its cutting operation, the shaft F will be rotating in one direction, carrying the revoluble part or center piece 1, rigidly secured thereto, with it in its revolutions. The center piece 1, through the medium of the auxiliary friction devices 25 25 and connections between the plates 23 and 24, maintains the lever 6 continuously against one of the stops 21 without chattering, with the clamp 3 out of intimate frictional engagement with the center piece 1. This relation of the parts continues until the direction of the feed of the planer-table is reversed, when the direction of revolution of the center piece 1 is also reversed and the lever 6 leaves the pin 21 and is brought toward a radial line with relation to the center piece. The clamp 3 is thereby allowed to make intimate frictional engagement with the center piece 1, thereby bringing all parts of the clutch into intimate and similar moving relation and turning all the parts about the axis of the center piece 1. When the parts are in this relation, the plate 23, with the crank, is turned with the center piece, and by reason of the eccentric position of the crank motion is communicated to the rack 44 and the tool on the cross-rail is shifted. This action is momentary, and during the same the lever 6 is carried from the direction of the first pin 21 with the center piece until it strikes the other pin 21, which arrests the movement of the lever while the center piece continues its revolution and swings the lever on its pivot, bringing it out of radial line with relation to the center piece and causing the other diagonally-opposite contact-faces on the lever to take against the projections 5 5 and separate the projections and ends of the clamp. In Fig. 6 I have shown in dotted lines the position the friction-ring and lever will assume when brought out of the plane of the radial line of the center piece. This action releases the positive intimate engagement between the clamp 3 and the center piece 1; but the normal tendency of the clamp would be to spring back into engagement with the center piece, and in practice in the old constructions the clamp does spring back immediately after the lever strikes the stop and is returned, so that the lever again makes intimate contact with the stop as soon as engagement between the clamp and center piece is again made, and then springs back again, this reciprocating action being very rapid, although not very great, and producing chattering and abrasion between the clamp and center piece, as hereinbefore mentioned, and it is to avoid this that I provide my auxiliary friction devices, which maintain sufficient resistance between the center piece and the plates to maintain the lever in its assumed position against the stop, with the center piece and the clamp continuously relieved of positive intimate frictional engagement until the direction of motion of the planer-table is again reversed, when the lever is swung back to its original position against the first stop 21. During this last movement, however, there is no corresponding movement of the tools from the crank 42, because during it the ratchet and pawl connecting with the pinion 56 are moved back and brought to their original normal position ready to take a new hold to move the tool. When the direction of the movement of the planer-table is again reversed, the operation as herein described is repeated.

In practice it is desirable to have a substantial grip between the primary clutch and the center piece in order to carry the clutch with the center piece as soon as engagement is made between the two, so that there will be no relative movement between the two during engagement and that the part moved by the crank-pin may be carried an equal distance each time engagement is made with the center piece by the clutch, so that its duty—for instance, moving a tool-head or slide—may be positively and accurately performed, and it is also desirable that the clutch shall also "let go" at the proper time to prevent wear and jar between the metallic faces between the clutch and center piece. The impetus that the end of the lever has gained by the time it strikes the stop will aid in throwing the primary clutch out of engagement with the center piece, and it is then only necessary to maintain this relieved relation of

the parts. I provide my auxiliary friction device of leather or non-abrasive or non-metallic substance for this purpose. It exerts a uniform pressure just sufficient to maintain the lever against the stop, with the clamp and center piece maintained in disengaged position, without chatter, jar, noise, or wear.

It will readily be seen that the chattering, wearing, tearing, and abrasive action between the center piece 1 and the clamp 3 and the shock on the parts which would otherwise be occasioned by the lever striking one of the pins without means for maintaining the lever in assumed position is obviated by means of my auxiliary friction devices and the devices herein shown and described, which maintain the clamp and center piece out of positive intimate frictional engagement when such engagement is not required to move the rack or other part that may be desired and provides a device in which a momentary positive engagement for moving a part may be had, with auxiliary friction device to maintain the former parts out of intimate frictional engagement when such intimate frictional engagement is not desired. If it were not for the auxiliary friction devices, the tendency of the clamp would be to spring back into positive frictional engagement with the center piece, which springing back would occur throughout the entire movement of the planer-bed and cause chattering, shock, jolting, and abrasive action between the center piece and the clamp. It is for the purpose of obviating this that I provide my auxiliary friction devices, and I overcome these objections in a very efficient and satisfactory manner by means of my improved device, in which I can always provide sufficient friction, the amount of which is easily adjusted, and which is also free from abrasive action, to maintain the primary friction-clutch out of engagement with the center piece 1, and so make it absolutely certain that there will be enough play between the center piece and the clamp to prevent the destructive and disastrous results which might occur without the application of my improved auxiliary friction devices herein shown and described.

It is obvious that changes may be made in the constructions I have preferred to show without departing from the spirit of my invention.

I claim—

1. In a clutch, the combination of a revoluble part, a friction-clamp therefor acting under spring-pressure, means for relieving the engagement between the friction-clamp and the revoluble part, with mechanism actuated independently of the friction-clamp by the revoluble part and acting against the continuing spring-pressure of the friction-clamp upon the part for relieving the engagement between the friction-clamp and the revoluble part to maintain the friction-clamp and revoluble part in relieved relation, substantially as described.

2. The combination of a revoluble part rotating alternately in opposite directions, a friction-band taking about the same, and normally moving therewith, a crank-plate, a lever fulcrumed between the ends of the friction-band for opening the same, contact-faces on the lever for the ends of the friction-band, a pair of stops for the outer end of the lever, a secondary friction device acting independently of the friction-band from the revoluble part against the fulcrum of the lever for maintaining the lever out of normal position and against a stop and maintaining contact-faces on the lever against the ends of the friction-band and thereby opening the latter for relieving the engagement between the friction-band and the revoluble part, substantially as described.

3. The combination of a revoluble part rotating alternately in opposite directions, a friction-band taking thereabout, and arranged to be actuated thereby, a crank-plate, with a positive connection between the band and the crank-plate, a lever fulcrumed to the crank-plate, with contact-faces thereon for taking against the ends of the friction-band for opening the latter, stops for the lever, an independent secondary friction device between the revoluble part and the crank-plate and acting through the crank-plate on the fulcrum of the lever for maintaining the contact between the lever and a stop, and the continuous operative release of the friction-band with relation to the revoluble part by opening the friction-band, substantially as described.

4. The combination of a revoluble part rotating alternately in opposite directions, a friction-band taking thereabout, and arranged to be actuated thereby, a spring for yieldingly forcing the ends of the band toward each other, a crank-plate, with a positive connection between the band and the crank-plate, a lever fulcrumed to the crank-plate, with contact-faces thereon for taking against the ends of the friction-band for opening the latter, stops for the lever, an independent secondary friction device between the revoluble part and the crank-plate and acting through the crank-plate on the fulcrum of the lever for maintaining the contact between the lever and a stop and the continuous operative release of the friction-band with relation to the revoluble part by opening the friction-band, substantially as described.

5. The combination of a revoluble part rotating alternately in opposite directions, a friction-band taking thereabout, and arranged to be actuated thereby, a spring for yieldingly forcing the ends of the band toward each other, tension-adjusting mechanism for the spring, a crank-plate, with a positive connection between the band and the crank-plate, a lever fulcrumed to the crank-plate, with contact-faces thereon for taking against the ends of the friction-band for opening the latter, stops for the lever, an independent secondary friction device between

the revoluble part and the crank-plate and acting through the crank-plate on the fulcrum of the lever for maintaining the contact between the lever and a stop and the continuous operative release of the friction-band with relation to the revoluble part by opening the friction-band, substantially as described.

6. The combination of a revoluble part, a primary clutching device therefor, a part adapted to normally rotate with the revoluble part, an auxiliary friction device operatively interposed between the latter part and the revoluble part, means for normally yieldingly pressing the normally-rotating part toward the revoluble part, means for adjusting the latter means, means connecting with the said latter part and normally rotating therewith arranged for relieving the engagement between the primary clutching device and the revoluble part, and a stop for arresting the latter means, and constructed and arranged for maintaining the primary clutching device in relieved relation to the revoluble part, substantially as described.

7. The combination of a center piece 1, a friction-band 3, a lever 6 for opening the friction-band, stops for the lever, plates 23 and 24, a yielding connection between the plates, and auxiliary friction devices 25, 25, constructed and arranged substantially as described.

8. The combination of a center piece alternately revolving in opposite directions, a friction-band therefor, a lever for opening the friction-band, stops for the lever, a plate 23 journaled in the center piece and connecting with the lever, with an auxiliary friction device between the plate and the center piece, constructed and arranged substantially as described.

9. The combination of a center piece, a friction-band taking thereabout, an opening in the friction-band, a lever for separating the ends of the friction-band, a stop for the friction-band and acting as a fulcrum therefor against the power of the lever, with a stop for the lever, and an auxiliary friction device for maintaining the lever against the stop, substantially as described.

In testimony whereof I have signed my name hereto in the presence of two subscribing witnesses.

ALBERT E. ROBINSON.

Witnesses:

JOHN C. ROGERS,

EMIL RAPP.