

No. 647,975.

Patented Apr. 24, 1900.

H. A. & E. H. LIEBERT.

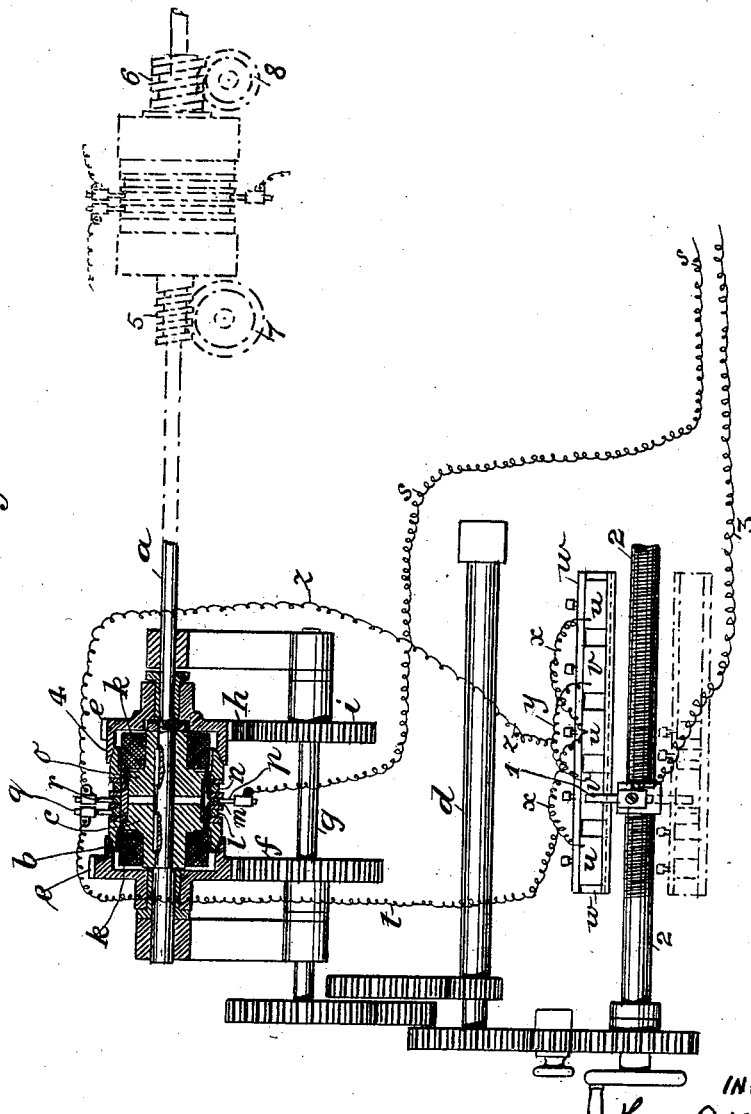
**AUTOMATIC FEEDING AND REGULATING DEVICE FOR MACHINE TOOLS.**

(Application filed Dec. 8, 1899.)

(No Model.)

3 Sheets—Sheet 1.

*Fig. 1.*



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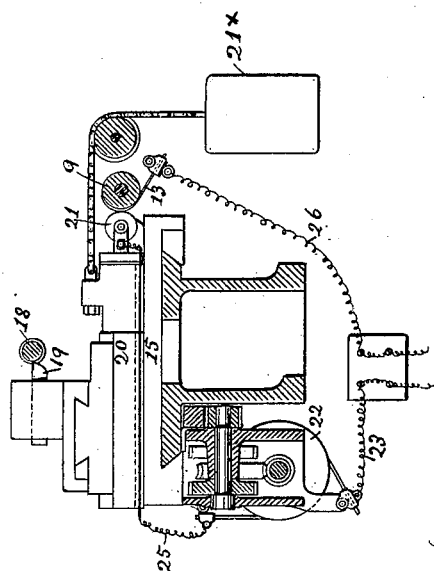
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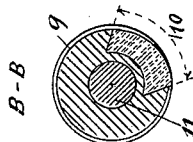
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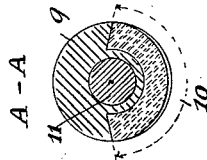
*Fig. 6.*



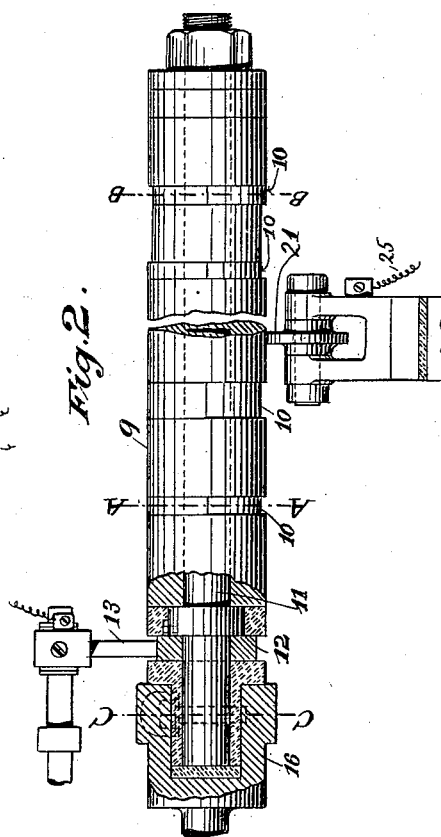
*Fig. 4.*



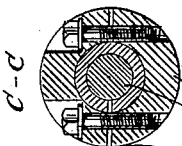
*Fig. 3.*



*Fig. 2.*



*Fig. 5.*



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3 Sheets—Sheet 3.

Fig. 7.

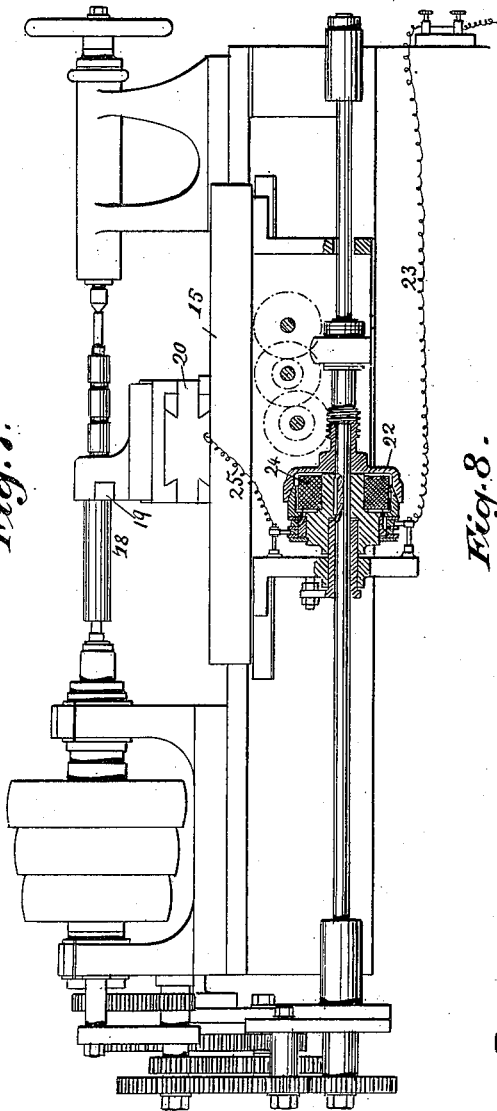
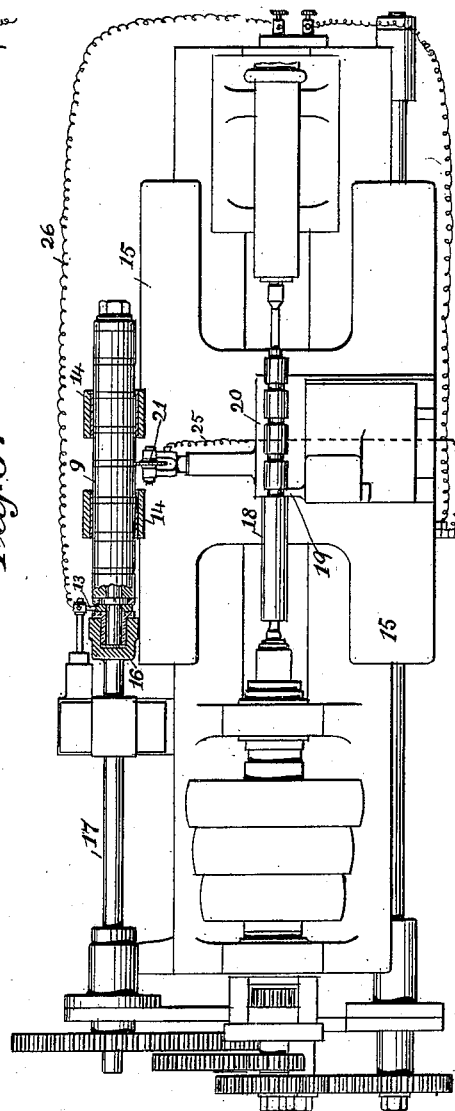


Fig. 8.



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# UNITED STATES PATENT OFFICE.

HENRY ANTON LIEBERT AND EMIL HERMANN LIEBERT, OF MILNROW,  
ENGLAND.

AUTOMATIC FEEDING AND REGULATING DEVICE FOR MACHINE-TOOLS.

SPECIFICATION forming part of Letters Patent No. 647,975, dated April 24, 1900.

Application filed December 8, 1899. Serial No. 739,651. (No model.)

*To all whom it may concern:*

Be it known that we, HENRY ANTON LIEBERT and EMIL HERMANN LIEBERT, subjects of the Queen of Great Britain, residing at Milnrow, in the county of Lancaster, England, (whose post-office address is Perseverance Works, Milnrow,) have invented new and useful Improvements in Automatic Feeding and Regulating Devices for Machine-Tools, (for which we have made application for patent in Great Britain, No. 4,473, bearing date March 1, 1899,) of which the following is a specification.

Our invention relates to improvements in machine-tools, and has for its object to provide means whereby the various feeds and cuts necessary to produce the work desired will instead of being regulated by hand, as hitherto, be brought into and out of action by electric currents governed by a compound former, each part or segment of which controls a movement of the cutting-tool, thus causing ordinary machine-tools to produce their work automatically.

The invention consists, first, in the application to the feed motion of the tool of electromagnet-clutches which bring the feeds in and out of action as may be required; secondly, in the use of a sliding electrical contact driven continuously from the driving-shaft of the machine or independently and adapted to make and break the electrical contact for the purpose of bringing the said clutches in and out of action, and, lastly, in the combination of a cross-feed actuated by a former, which is driven continuously, and a traverse feed brought in and out of gear by the said clutches. We attain these objects by the mechanism illustrated in the accompanying three sheets of drawings, in which—

Figure 1, Sheet I, is a diagram of one form and application of our electromagnet-clutches and sliding electrical contact. Fig. 2, Sheet II, is a sectional plan; and Figs. 3, 4, and 5 are cross-sections thereof at lines A A, B B, and C C, respectively, of the electrically-connected former. Fig. 6 is a cross-section, Fig. 7, Sheet III, a front view, and Fig. 8 a plan, of a lathe, showing our improvements applied thereto.

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

In carrying out the first and second parts of and employing our invention for the purpose of reversing the feed-shaft *a* of a machine-tool, Fig. 1, we employ upon the same two cone-clutches *b c* and *o 4*, the "she" parts *b* and *4* of which are adapted to rotate loosely thereon and are driven in opposite directions, in the present instance from the driving-spindle *d* of the machine, by means of spur-gearing. For this purpose we form each of the she clutch parts externally with a wheel *e*, one of the same gearing directly into a wheel *f*, secured upon a shaft *g*, interposed between the feed-shaft *a* and driving-spindle *d*, and the other indirectly by means of a pinion *h* into a second wheel *i*, also secured upon the shaft *g*. The "he" clutch parts *c* and *o* are keyed upon the feed-shaft *a* and each contains an electromagnet-coil *k*, connected to rings *l m n*, employed around the clutch parts *c* and *o*, which rings are in contact with the brushes *p q r*. The brush *p* is connected to a wire *s*, leading to an electric source, and the brush *q* to a wire *t*, leading to a number of bars *u*, rendered relatively adjustable in a frame *w*, formed of insulating material, and connected to each other by wires *x*. The brush *r* is similarly connected by the wire *z* to a wire *y*, by which the bars *v* are connected together. In connection with the said adjustable bars we employ a brush 1, carried by a screw 2, suitably rotated from the driving-spindle *d* and adapted to slide over the contact-bars *u* and *v* in and out of contact therewith. This brush is also connected by a wire 3 to an electric source, and, together with the said adjustable bars, forms a switch, so that each time each comes into contact with one of the said bars the electric current will be caused to flow through and couple up one of the clutches *b c* and *o 4*, and thus rotate the shaft *a* to the left or right, as the case may be, while when coming out of contact with the said bars the electric current will be broken and the respective clutch thrown out of gear.

When applying our invention, for instance, to the traverse and cross-feed of a machine-

tool, the ordinary sliding and surfacing carriage is used, and two worms 5 6 are employed upon the shaft *a*, (see dotted lines, Fig. 1,) which are adapted to be brought electrically in and out of action with a double cone keyed upon the shaft *a* and containing electromagnet-coils connected by wires to rings arranged in contact with brushes and by wires with another series of adjustable bars in exactly the same manner as when applied for the reversion of the back shaft, while the worm 5 gears into the worm-wheel 7 of the cross-feed and the worm 6 into the worm-wheel 8 of the traverse.

According to a modification we may make the electromagnet-clutches act on the worm-wheels instead of on the worms—that is to say, allow the worm-wheels to run loose and let them only drive the feed-motion gearing when held by an electromagnet friction-clutch similar to the ones described above. It is obvious that the length of time for which the said clutches remain in action is dependent on the speed of the screw 2 and the length of the said bars, which may be varied at will to suit circumstances.

Referring to the last part of our invention and Sheets II and III, we may in lieu of the said insulated contact bars and brush employ a former used in connection with a single electromagnetic clutch, such former being used, say, in lathes for turning shafting, pins, or the like requiring shoulders, grooves, or the like, and which consists of a metal cylinder 9, having cam-faces 10, formed of insulating material and secured to a metal shaft 11, having a metal ring 12, arranged to run in contact with a brush 13. The said former is mounted in bearings 14, formed on the carriage or slide 15 and bushed with insulating material. It is secured to and continuously rotated by a chuck 16, carried by a shaft—say in a lathe—by the back shaft 17, rotated from the head-stock by gearing—say such as shown in Figs. 7 and 8.

18 is the object to be operated upon, and 19 the tool carried by the slide 20, mounted on the carriage 15, which tool-slide is furnished with a wheel 21, kept in contact with the former 7 8 9 by the weight 21<sup>x</sup>, so that the tool 19 will take a copying cut off the object under operation. The electrical clutch 22 actuates the traverse of the slide or carriage 15, the current passing from the electric source through wire 23, clutch-coil 24, and wire 25 to the insulated bracket carrying the wheel 21,

then to former 9, brush 13, and so back by wire 26 to electric source. When the wheel 21 is touching one of the insulated cam-faces 10, the traversing feed is interrupted and the tool moves in and out under control of said cam-faces, while when on metal cylinder 9 the carriage traverses—i. e., while the wheel 21 on the tool-slide runs on the metal cylindrical part of the former the electric circuit remains intact and the action of the tool is thus electrically regulated or controlled by such part, while when the said wheel passes onto the said insulated cam-shaped part of the former the electric circuit will be broken and the action of the tool thus regulated mechanically by the said insulated part.

The clutch 22 (shown in Fig. 7) is a single one, and in principle and action the same as the double one previously described.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In machine-tools, the combination of a rotary cylindrical former or pattern composed partly of cylindrical metal and partly of insulated cam-shaped sections which present a partly-cylindrical and partly-curved periphery, with an electromagnetic clutch, the said former being adapted to regulate the feeds partly mechanically and partly electrically, all substantially as set forth.

2. The combination with mechanism for operating cutting-tools, and a clutch for controlling the operation of the feed of said tools, of electrical means for actuating said clutch and a switch for controlling the electric current comprising a contact-brush fed in a predetermined relation to the movement of the cutting-tool and contacts engaged by said brush arranged in a predetermined relation to the article to be formed by said tool.

3. The combination with a lathe of a tool-carrier, means for feeding the same longitudinally of and means for feeding the same transversely in relation to the stock, means for electrically controlling one of said feeds and a pattern controlling the other, feed, said pattern comprising one of the switch members.

In witness whereof we have hereunto set our hands in presence of two witnesses.

HENRY ANTON LIEBERT.  
EMIL HERMANN LIEBERT.

Witnesses:

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STANLEY E. BRAMALL.