

Jan. 10, 1939.

M. THURNER

2,143,218

DEVICE FOR LIFTING AND LOWERING HEAVY OFFICE MACHINES IN DESKS

Filed Sept. 3, 1937

Fig. 1.

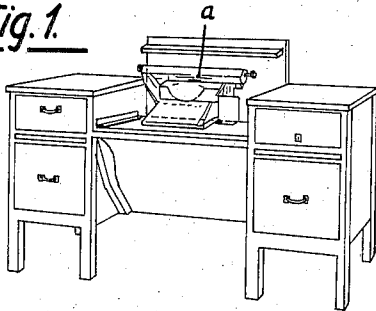


Fig. 2.

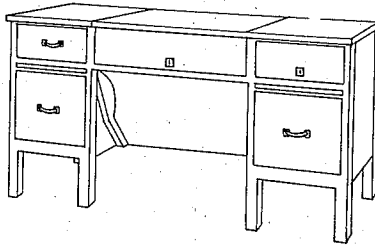


Fig. 3.

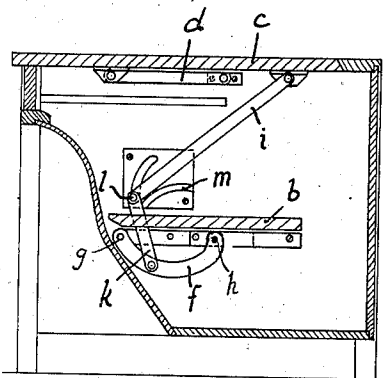


Fig. 4.

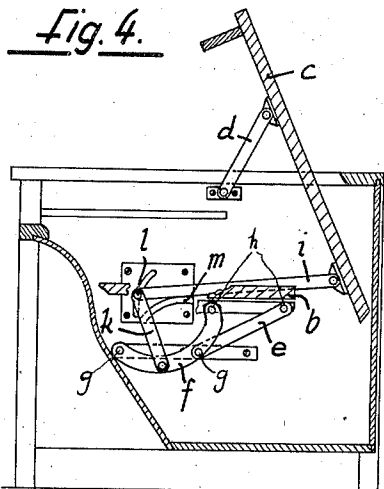
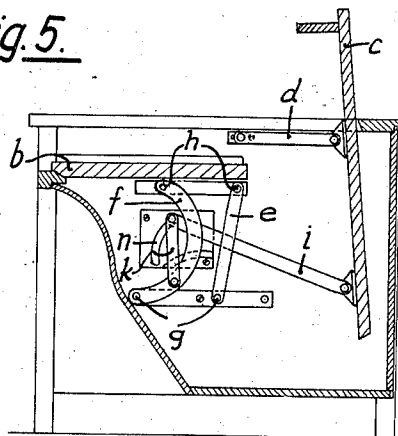


Fig. 5.



Inventor:

Michael Thurner
By Young Emery & Thompson
Attorneys

UNITED STATES PATENT OFFICE

2,143,218

DEVICE FOR LIFTING AND LOWERING
HEAVY OFFICE MACHINES IN DESKS

Michael Thurner, Geislingen/Steige, Germany

Application September 3, 1937, Serial No. 162,363
In Germany October 1, 1936

12 Claims. (Cl. 312—24)

This invention relates to office desks for disappearing bookkeeping and other heavy office machines, and particularly to the lowering and lifting device of such desks.

The known kinds of office desks of this class are suitable only for light office machines, as typewriters, but not for high and heavy office machines of the type now in use, because their lifting force is insufficient and they are not adapted for great weights.

The invention has for its object to provide means which permit easy lowering and raising of heavy, large office machines, and this object is attained by employing links and levers for lifting the supporting plate of the machine into vertical position by means of a set of links, levers and guides through tilting and lowering of the table top, by the use of movable pivot points instead of stationary ones as hitherto. According to the present invention, these links and levers are hingedly connected with the tiltable and lowerable top of the desk and also with the guide of the supporting plate and are moved in such a manner that their leverage during raising of the machine is small in the beginning, but increases with the lift. In this way, heavy machines can be raised without difficulty, the more so, as the weight of the rearwardly tiltable and lowerable top, by means of which raising and lowering is effected, has a considerable balancing effect. The small initial leverage is advantageous for the reason that the carrying arms, i. e., the links of the levers, are at first approximately in horizontal position, so that the lifting of the machine out of its lowermost position requires greater force which is produced by the small leverage, whilst the lift is quite small. When the links are at the end of the stroke or disposed in almost vertical position, only a slight expenditure of force is required, and for this reason the leverage is large to attain the necessary lift.

For this purpose the rocking lever has not a stationary fulcrum or pivot point but a movable one and this is made possible by loosely supporting the lever on a curved bearing surface providing supporting points differing in height, over which it rolls during motion. The construction of the support is immaterial per se, and the latter may for instance consist of a curved ledge surface as shown in the figures or of a plurality of spaced individual stationary points disposed on a curved line.

The lower end of each rocking lever is guided in longitudinal direction by a curved slot in which a pivot pin of the lever moves, preferably the pin

connects the lever with the corresponding one of the guiding links to form a hinge joint.

By way of example, the invention is illustrated in the accompanying drawing, in which Figure 1 is a perspective view of an open desk provided with the lowering and raising device according to the present invention and with the machine in raised position; Fig. 2, a similar view of the desk closed and with the machine in lowered position; and Figs. 3, 4 and 5 are sectional side views of the desk and of the lowering and raising device showing the progressive lifting of the supporting plate.

Referring to the drawing, the heavy machine *a* to be lowered is placed on a supporting or base plate *b* capable of being lifted parallel to itself from the lowermost or closed position shown in Fig. 3 into the half way position in Fig. 3 and finally into the operating position shown in Fig. 5. Lifting of the base plate is effected by means of the table top *c* of the desk, which can be rearwardly tilted from the closed position shown in Fig. 3 into an approximately vertical, intermediary position in Fig. 4, through the medium of the links *e* and *f* and then raised into operating position as in Fig. 5. The top *c* acts as counter-weight for the machine *a*, the weight of which is thus partly balanced.

The links *e* and *f*, are hinged at their lower ends as at *g* in the side walls of the table and at their upper ends as at *h* beneath the base plate *b* in such a manner that said plate moves parallel to itself and always has a horizontal position. For this reason the four hinge points, *h*, *h* and *g*, *g* constitute the corner points of a parallelogram.

The arcuate link *f* is controlled by the top *c* through the rocking lever *i* and link *k* which is hinged at the lower end of the lever *i* as at *l*. By tilting back the top *c* into nearly vertical position and partly lowering it, the links *e*, *f* are simultaneously moved and the supporting plate *b* is thus raised parallel to itself, see Fig. 4, and by contained tilting of the top *c*, the base plate finally takes the position in Fig. 5.

According to the invention, the leverage of the rocking lever *i* varies during raising and lowering in such manner that with increasing stroke it becomes smaller.

For this purpose the fulcrum of the rocking lever *i* travels along with the lever *i*. In the construction shown this is effected by loosely supporting the lever *i* on a curved ledge *m* over which it rolls during motion, so that fulcrum or supporting contact point between the lever *i* and the ledge *m* for the time being constitutes the pivot point and this point travels over the curved ledge

m, whereby the leverage of the lever *i* is constantly changed.

To prevent longitudinal displacement of the lever *i* during its rolling motion, it is guided in a curved slot *n* which engages the end of the pivot pin *l*. This pivot pin also provides a hinge between the lever *i* and the link *k*. In the lowered position of the supporting plate *b*, see Fig. 3, the pin *l* is disposed in the lower end of the guide slot *n* and at the beginning of lifting forms simply an axis of rotation and the lever *i* is then a simple pull rod until the pin *l* is displaced upwardly in the slot *n* and the lever *i* rolls up on the ledge *m*.

I claim:—

1. A desk comprising a desk body having an upper opening, a top closing said opening and connected to said body by hinge means including links, whereby said top may be tilted rearwardly into approximately vertical position, a supporting plate for a machine, a pair of links hinged at one end to each end of said plate and at the other end to the desk body, rocking levers each articulated at one end to the desk top and connecting rods hingedly engaging the other ends of the rocking levers with two of said links, a pivot pin connecting each lever with its connecting rod, said links being movable by the tilting of the desk top with the aid of said rods and levers to raise or lower the supporting plate, means cooperating with said pivot pins for guiding the levers in their movement and other means providing a travelling fulcrum for the levers in order to vary their leverage to insure at the beginning of the raising of the supporting plate the application of maximum force to lifting and the gradual decrease of such force during further progress of the lifting operation.

2. A desk according to claim 1, wherein the other means includes a bearing surface having supporting points differing in height is provided on which the rocking levers are loosely positioned and over which they roll while moving to vary the position of the fulcrum.

3. A desk according to claim 1, wherein the other means includes a bearing surface having supporting points differing in height is provided on which the rocking levers are loosely positioned and over which they roll while moving to vary the position of the fulcrum, said bearing surface having a curved form.

4. A desk according to claim 1, wherein the other means includes a bearing surface having supporting points differing in height is provided on which the rocking levers are loosely positioned and over which they roll while moving to vary the position of the fulcrum, said bearing surface comprising a plurality of individual supporting points disposed on a curved line.

5. A desk according to claim 1, wherein the means for guiding the rocking levers in longitudinal direction comprise a curved slot in the table engaged by said pivot pin of the levers.

6. A desk according to claim 1, wherein the means for guiding the rocking levers in longitudinal direction comprise a plate having a curved slot engaged by said pivot pin of the levers, said guide pin being the connecting pin of the levers and the links of the flexible parallelogram.

7. In a desk having a base plate for an instrument, means for raising and lowering the base plate in parallel relationship, said means comprising a series of links and a rocking lever having a movable fulcrum, whereby the leverage

length of said lever correspondingly changes during operation.

8. In a desk having a base plate for an instrument, means for raising and lowering the base plate in parallel relationship, said means comprising a series of links and a rocking lever having a movable fulcrum, and a bearing surface for said lever providing contact points therefor of different height and constituting said fulcrum, whereby the leverage length of said lever correspondingly changes during operation.

9. In a desk having a base plate for an instrument, means for raising and lowering the base plate in parallel relationship, said means comprising a series of links and a rocking lever having a movable fulcrum, and a curved bearing surface for said lever providing contact points therefore of different height, and constituting said fulcrum, whereby the leverage length of said lever correspondingly changes during operation.

10. In a desk having a base plate for an instrument, means for raising and lowering the base plate in parallel relationship, said means comprising a series of links and a rocking lever having a movable fulcrum, and a series of contact points for said lever formed along an arcuate line, said contact points constituting said fulcrum, whereby the leverage length of said lever correspondingly changes during operation.

11. In a desk having a base plate for an instrument, means for raising and lowering the base plate in parallel relationship, said means comprising a pair of links having their upper ends hinged to said plate and their lower ends hinged to the table side in such a manner that the hinge points constitute a theoretical parallelogram adapted to cause said plate to have a parallel motion to itself, a rocking lever having one end hinged to the table top, a connecting rod having pivot connection with the other end of said rocking lever and hinge connection with one of said links, and an arcuate path provided in said table with which said rocking lever is adapted to contact in order to form a movable fulcrum for said lever during the main operation of the rocking lever while its pivot connection with said rod constitutes a stationary pivot for said lever during the first part of the raising operation of the base plate.

12. In a desk having a base plate for an instrument, means for raising and lowering the base plate in parallel relationship, said means comprising a pair of links having their upper ends hinged to said plate and their lower ends hinged to the table side in such a manner that the hinge points constitute a theoretical parallelogram adapted to cause said plate to have a parallel motion to itself, a rocking lever having one end hinged to the table top, a connecting rod having pivot connection with the other end of said rocking lever and hinge connection with one of said links, an arcuate path provided in said table with which said rocking lever is adapted to contact in order to form a movable fulcrum for said lever during the main operation of the rocking lever while its pivot connection with said rod constitutes a stationary pivot for said lever during the first part of the raising operation of the base plate, and a curved guide slot on the table engaging said pivoted end of the lever to limit its longitudinal movement.

MICHAEL THURNER.