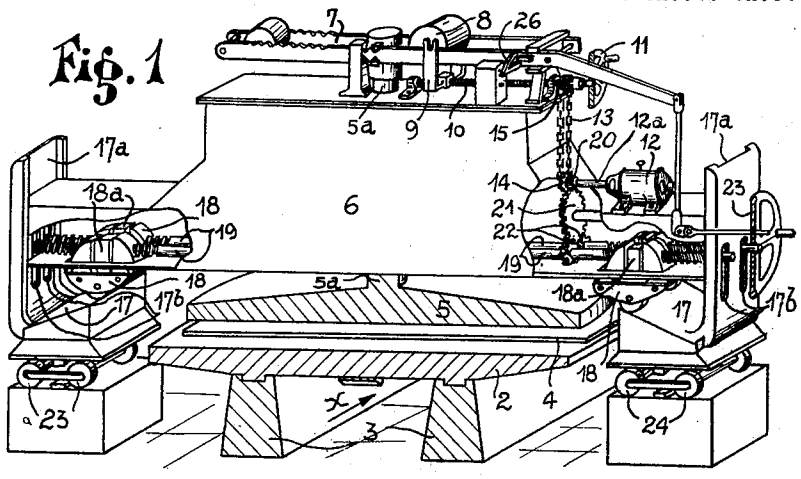
Aug. 16, 1932. C. HEUZE 1,871,992

GRINDING, SMOOTHING, AND POLISHING APPARATUS

Filed March 4, 1931 2 Sheets-Sheet 1

Fig. 1



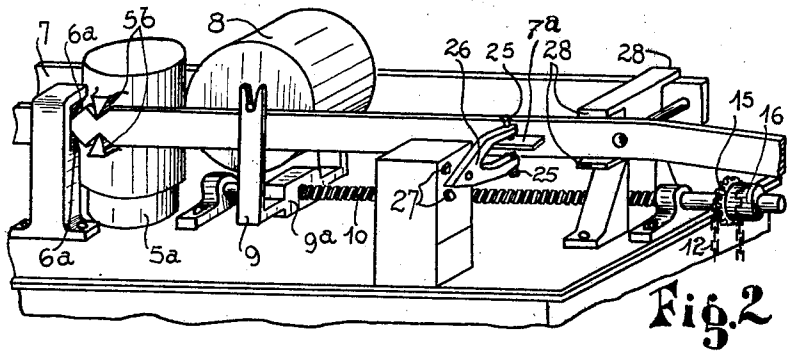
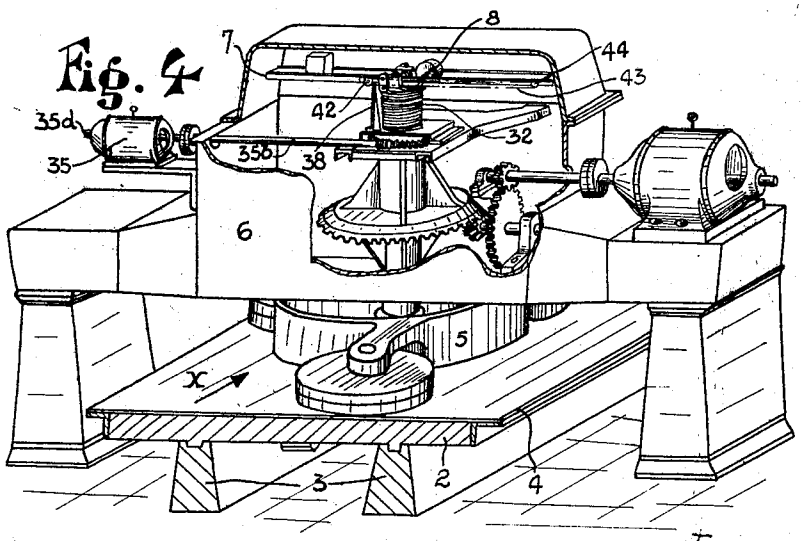


Fig. 2

Fig. 4



Inventor:
Charles Heuze
By Emil Bönnelycke
Attorney

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Fig. 5.

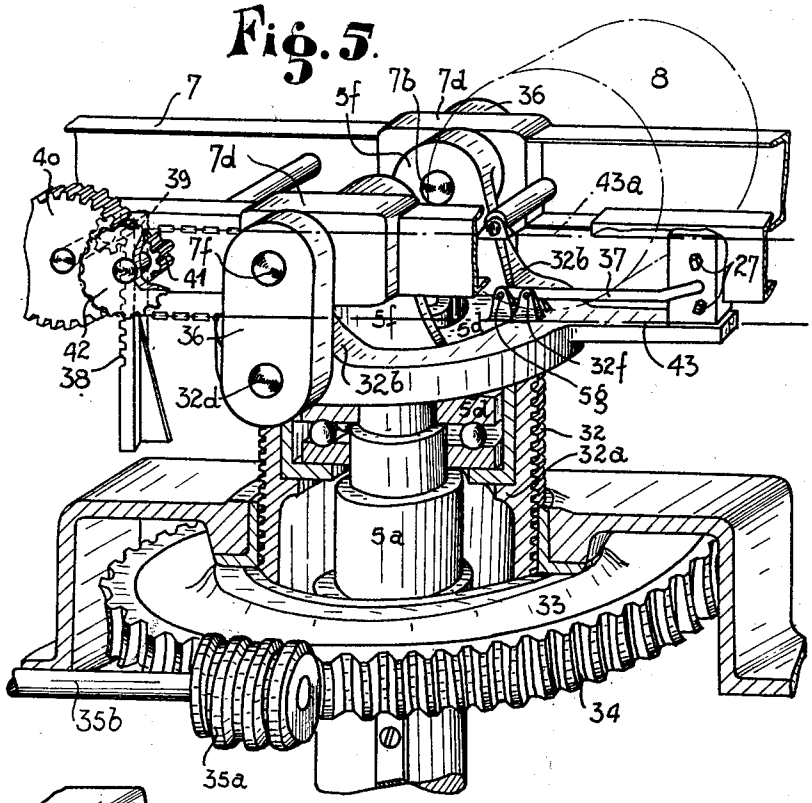
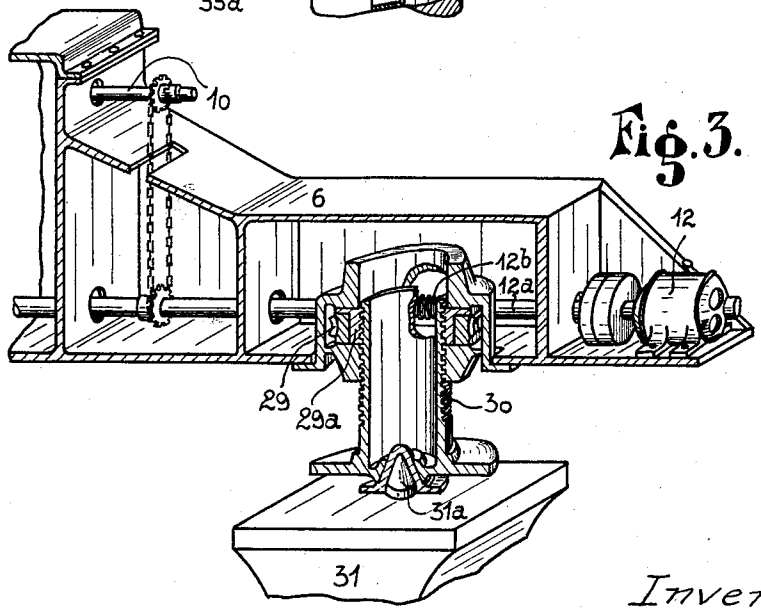


Fig. 3.



Inventor:
Charles Heuze
By Emil Bönnelycke
Attorney

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UNITED STATES PATENT OFFICE

CHARLES HEUZE, OF AUVELAIS, BELGIUM

GRINDING, SMOOTHING, AND POLISHING APPARATUS

Application filed March 4, 1931, Serial No. 520,078, and in Belgium March 31, 1930.

This invention relates to an apparatus for grinding, smoothing and polishing plate glass, sheet glass, marble and other similar materials, in which the tools are carried by beams arranged transversely to the tables which carry the materials to be treated, and in which a compensating device is provided for the wear and tear of each tool.

Mechanical devies are known for compensating the wear of the tool, by means of the variable action of a weight. In these devices the variation of the reaction of the weight on the tool is obtained by varying the amount of the weight. These devices have the disadvantage that numerous partial weights are employed to compensate the wear of the tool in a manner which is approximately progressive.

To avoid this inconvenience, the invention provides that the intensity of the reaction of the weight on the tool varies by making said weight to slide along a lever connected with the shaft of the tool and pivoting round a point of support fixed to the beam.

In order to maintain said lever approximately horizontal to allow the use of large leverages and therefore the use of light weights which give a very exact compensation, the invention provides to mount said lever on a pivot of variable height in respect to the tables. According to one embodiment of the invention, said pivot is fixed on the beam and the latter is carried by supports, the height of which can be varied. According to another embodiment of the invention, said pivot is fixed on a sleeve of which the height can be varied in respect to the beam which carries it.

To facilitate the control of the wear of the tool, the invention also provides the disposal of abutments on either side of the lever which carries the weight.

In order to obtain the automatic displacement of the weight according to the wear of the tool, the invention provides to mount said abutments on an arm which swivels on a pivot carried by the same part as that which carries said lever, said arm controlling by means of its oscillations the passage of motive power towards a motor intended to drive the device which displaces the weight.

The invention also provides that the apparatus presents between the device which controls the regulation of the height of the pivot of the lever which carries the weight and that which controls the displacement of the weight on said lever, a mechanical connection such that the lowering of the pivot corresponding to a predetermined amount of wear of the tool, causes the weight to be displaced, so that the variation in the reaction exerted by same on the shaft of the tool, is equal to the loss of weight of the tool due to said wear.

However in order to regulate the height of the beam according to the thickness of the object to be worked, without altering the position of the weight, the invention provides that a disengaging member be arranged in above named mechanical connection.

Further details and characteristics of the invention will appear in the course of the description of the drawings annexed to this specification, which show in perspective some embodiments of the invention.

Figure 1 shows an apparatus according to the invention, partly broken away and with a cross section of the tool and of the table which carries a plate of glass under treatment by said tool, in the case where the lever carrying the weight is mounted on the beam which has adjustable supports.

Figure 2 shows part of Fig. 1 on a larger scale.

Figure 3 shows a variety of the device to regulate the height of the beam supports, in section and partly broken away.

Figure 4 shows an apparatus according to the invention, partly broken away, in the case where the lever carrying the weight is mounted on a sleeve of adjustable height in respect to the beam whose height is fixed.

Figure 5 shows part of Figure 4 on a larger scale.

These figures show a table 2 which moves on guides 3 in the direction of the arrow X. This table carries a sheet of glass 4 treated by a tool 5. The latter is carried by a beam 6.

The shaft 5*a* of the tool 5 is connected to a lever 7 by means of the knife-edges 5*b*. This lever 7 pivots on the knife-edges 6*a* carried by the beam 6. On the lever 7 a weight 8 is supported, which can be displaced lengthwise on this lever. This displacement may be effected by a fork 9 fixed to a nut 9*a* engaging a screwed rod 10 which may be turned for instance by a handwheel 11.

The rotation of the screwed rod 10 may also be effected by an electric motor 12, by means of a mechanical connection made between the shaft 12*a* of said motor and the screwed rod 10. This mechanical connection may consist for instance of a chain 13 passing over toothed wheels 14 and 15. The wheel 14 is keyed on the shaft of the electric motor 12 whereas the wheel 15 is loose on the screwed rod 10, but may be connected angularly to the latter by means of a coupling sleeve 16 sliding on said rod in an axial direction, whilst remaining keyed on this rod in an angular direction.

The beam 6 rests at its ends on supports adjustable in height. These supports may be for instance inclined planes 17 on which rest trucks 18 immovable in respect to the beam in a vertical direction.

These trucks 18 may be displaced in the direction of the slope of the inclined planes 17. This displacement may be made for instance simultaneously for the trucks arranged at opposite ends, by engaging nuts 18*a* fixed to the trucks with screwed rods 19 whose opposite ends are screwed in opposite directions, said screwed rods 19 being arranged to rotate. This rotation may for instance be effected by the electric motor 12, by means of gear wheels 20, 21 and 22. In case the electric current should fail, the rotation may be effected by hand with a handwheel 23 keyed upon one of the screwed rods 19.

By this means, according to the direction in which the screwed rods 19 are turned, the beam 6 may be raised or lowered in respect to the table 2. During these displacements, the beam 6 is guided vertically by guides 17*a* integral with the supports provided with the inclined planes 17. Grooves 17*b* are provided in these vertical guides 17*a* to allow of the displacement of the ends of the screwed rods 19.

These supports are shown mounted on rollers 24 so as to be capable of being moved with the beam carried by the supports, in a transverse direction to that of the arrow X by means of any known mechanism, not shown.

When the tool 5 wears away, its shaft 5*a* descends in respect to the beam 6 and causes the lever 7 to pivot round the knife-edges 6*a* in a clockwise direction. By this pivoting, one web 7*a* of the lever 7 approaches one of the two abutments 25 consisting of screws, whose position may be regulated in respect to an oscillating arm 26 which carries them and which is mounted on the beam 6. These abutments facilitate thus the control of the wear of the tools. This wear might be taken up by turning the electric motor 12 or one or the other of the handwheels 11 or 23 in the suitable direction, to lower the beam 6 until the tool 5 by contacting with the plate of glass, causes the lever 7 to pivot in the anticlockwise direction and brings back the web 7*a* towards the other of the two abutments 25.

The mechanical connection between the device which causes the vertical movement of the beam 6 and the one which displaces the weight 8 along the lever 7 is such that any lowering of the beam corresponding to a reduction in the thickness of the tool 5 causes a displacement of the weight so that the variation of the reaction on the tool 5 be equal to the variation in the weight of said tool due to said reduction in the thickness of same.

In order to effect these motions automatically, the invention also provides that the displacements of the oscillating arm 26, in respect to the meeting of the web 7*a* with one or other of the abutments 25, may be used to control the passage of motive power towards a motor intended to actuate the device which causes the weight to be displaced and the device which causes the displacement of the beam in height. In the case shown, the oscillating arm 26 may be used to establish an electric contact with one or the other of the contacts 27. The latter are inserted in the feed circuit of the electric motor 12. According to the contact with which the oscillating arm 26 is in touch, said motor turns in one direction or the other.

When the beam 6 is to be displaced in height without displacing the weight 8, so as to be able to regulate the height of said beam according to the height of the glass plate 4 under treatment, the sleeve 16 is disengaged so that the rotation of the toothed wheel 15 does not cause the screwed rod 10 to rotate.

To avoid any exaggerated oscillation of the lever 7 when the beam 6 is raised, the invention provides the arrangement of said lever between fixed stops such as 28.

According to the invention, the apparatus allows a small distance to be maintained between the lower part of the beam and the tool 5. It allows the sliding of the shaft 5*a* to be reduced to a minimum in case the tool is a grinding tool. If this tool is a polishing tool the sliding may be completely suspended.

The fact that the height of the beam can be regulated allows large leverages to be used for the lever 7 and consequently the use of light weights 8, which gives a very exact compensation.

According to the invention, the apparatus also allows the thickness of the glass plates 4 to be very easily fixed, since it suffices to note the position of the fork 9 and of the trucks 18

respectively on a graduation of the lever 7 and a graduation of the beam 6, and to utilize the figures noted, to fix the thickness of the glass by means of a table.

According to the embodiment shown in Figure 3, the regulation of the height of the beam 6 may be obtained by gearing a worm 12*b* carried by the shaft 12*a* of the motor 12 with a wormwheel 29 fixed on a nut 29*a* screwed on to a threaded column 30. The latter is mounted on a baseplate 31 by means of a pivot 31*a*.

According to the embodiment shown in Figures 4 and 5, the height of the beams cannot be regulated. However the lever 7 is always maintained in a practically horizontal position, because the pivot which supports it may be regulated in height with respect to the beam.

In this embodiment, whose use is specially advantageous for grinding tools, called "runners", on the shaft 5*a* of the tool 5 is fixed a head 5*d* engaging with a screwed sleeve 32. This head 5*d* can rest on a collar 32*a* of the sleeve 32. On the latter a nut 33 engages, fixed to the beam in height and able to turn at the same time as a worm wheel 34 which gears with a worm 35*a* mounted on the shaft 35*b* of a motor 35.

The head 5*d* of the shaft 5*a* of the tool 5 carries two bearings 5*f* each for a pivot 7*b* mounted in blocks 7*d* forming part of the lever 7. These blocks also carry other pivots 7*f* to which links 36 are connected, whose other ends are connected to ears 32*b* of the threaded sleeve 32 by means of pivots 32*d*.

When the tool 5 wears, the lever 7 pivots in the clockwise direction round the pivots 7*f*, which may also describe circular arcs with centres 32*d* and radii 32*d*—7*f*. This oscillating movement of the lever 7 is accompanied by a similar oscillating movement of an arm 37 pivoting at 32*f* on the screwed sleeve 32 and connected at 5*g* with the head 5*d*. This arm 37 fulfills a similar purpose to the oscillating arm 26 in the Figures 1 and 2. By means of its oscillations, it makes an electric contact with one or other of the contacts 27 interposed in the circuit of the motor 35. In case the tool 5 wears away, the motor 35 is started in a direction such that the sleeve 32 descends. This descent causes the lever 7 to become horizontal, by pivoting in the anticlockwise direction round the pivots 7*b* and brings the arm 37 into the position in which the current is cut off. This latter oscillating movement of the lever 7 causes a pinion 39 carried by the lever 7 to roll downwards on a fixed rack 38. Said pinion transmits its motion by gear wheels 40 and 41 to a toothed wheel 42 round which passes a chain 43 passing also round a toothed wheel 44 carried by the lever 7. It is evident that the descent of the pinion 39 causes the chain 43 to be displaced so that its upper length 43*a*, to which the weight 8 is fixed, moves the latter away from the shaft 5*a*.

As in the embodiment shown in Figures 1 and 2, the mechanical connection between the motor 35 and the chain 43 is such that any lowering of the screwed sleeve 32 corresponding to a determined reduction in thickness of the tool 5 causes the weight to be displaced so that the variation of reaction on the tool 5 be equal to the variation in the weight of said tool due to said reduction in thickness.

If the tool is to be raised rapidly, the motor 35 is driven in the suitable direction by manipulating a commutator not shown on the drawings. The rotation of the motor 35 causes the threaded sleeve 32 to rise, which by its collar 32*a* lifts the head 5*d* of the shaft 5*a* of the tool.

As in the embodiment shown in Figures 1 and 2, the possibility of turning the shaft 35*b* by hand is provided for. This shaft may have for instance a square end 35*d* on which a crank may be fitted.

It is evident that the invention is not exclusively limited to the embodiments shown and that many alterations may be made in the shape, the arrangement and the constitution of the parts employed in the embodiment, without exceeding the scope of this invention.

Thus it is evident that the table 2 may be rotary or fixed, that the cross beams such as 6 may be displaced parallel to the table 2 or may be fixed. The number of tools supported by each beam may be varied. The devices for regulating the height of the beam 6, the height of the screwed sleeve 32 and which displaces the weight 8 may also vary. The driving power may be other than electricity.

What I claim is:

1. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, a weight carried by each lever, means for displacing each weight along each lever, trucks for supporting the beams, inclined planes on which the trucks rest, and means for displacing the trucks along the slope of the inclined planes.

2. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight along each lever, trucks for supporting the beams, inclined planes on which the trucks rest, nuts mounted in said trucks, screwed rods passing in said nuts in the direction of the beams, means for rotating said screwed rods, and means for preventing said screwed rods from displacing axially relatively to the beams.

3. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for

supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight above each lever, trucks for supporting the beams, inclined planes on which the trucks rest, nuts mounted in said trucks, screwed rods passing in said nuts in the direction of the beams, means for rotating said screwed rods, and means for preventing said screwed rods from displacing axially relatively to the beams, the screwed rods presenting parts screwed in opposite directions in order to cause equal displacements of the trucks.

4. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight along each lever, nuts with vertical axis mounted in said beams, screwed vertical columns passing in said nuts, and means for rotating said nuts.

5. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, screwed rods axially immovable relatively to the beams, means for rotating said rods, nuts engaged on said rods, and a mechanical connection between each weight and a corresponding nut for displacing each weight along its lever by the rotation of the corresponding rod.

6. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight along each lever, and means for regulating the height of the pivots of the lever relatively to the beams.

7. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight along each lever, a threaded sleeve for supporting each pivot, a nut engaged on each threaded sleeve, means for rotating said nuts, and means for preventing these nuts from displacing axially relatively to the beams.

8. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, a chain connected to each weight, toothed wheels mounted on said pivoting levers for carrying the corresponding chain, gear wheels mounted on the corresponding lever for rotating one of said toothed wheels, and a fixed rack in contact with one of the said gear wheels.

9. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight along each lever, means for regulating the height of the pivots of the levers relatively to the tables, and a connection between these two means such that the lowering of the pivots corresponding to a determined wear of the tools, causes the weights to be displaced for an amount such that the variation of the reaction which the same exert on the shaft of the tools is equal to the loss of weight of the tools due to the above named wear.

10. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, means for displacing each weight along each lever, means for regulating the height of the pivots of the levers relatively to the tables, a connection between these two means such that the lowering of the pivots corresponding to a determined wear of the tools, causes the weights to be displaced for an amount such that the variation of the reaction which the same exert on the shaft of the tools is equal to the loss of weight of the tools due to the above named wear, and a disengaging member in the said connection.

11. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, a motor for displacing each weight along each lever, a motor for displacing the pivoting point of said levers so that the latter come back to a horizontal position after a certain inclination due to the wear of the tools, an interrupter in the feeding circuit of the said motors, and means for displacing the said interrupter by the displacements of the said levers so that the passage of the driving power towards the said motors is established when the levers are in an inclined position and is cut off when the levers are back in a horizontal position.

12. Apparatus for grinding, smoothing and polishing plate glass, comprising tables for supporting the glass, tools for treating the glass, a pivoting lever connected to each tool, beams for supporting the said levers, a weight carried by each lever, a motor for

displacing each weight along each lever, a motor for displacing the pivoting point of said levers so that the latter come back to a horizontal position after a certain inclination due to the wear of the tools, an interrupter in the feeding circuit of the said motors, and adjustable abutments mounted on each lever on either side of the said interrupter, the said interrupter being so arranged that it establishes the passage of the driving power towards the said motor when the said levers are in an inclined position and cuts this passage off when the said levers are back in a horizontal position.

In testimony whereof I affix my signature.

CHARLES HEUZE.