

Automatic Point Counter

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Introduction

Automatic point counters consist of a stage with sample holder and a digital counter. The counter allows users to track a multitude of cells, species, or grains within a sample. The counter triggers an electro-mechanical response in the stage, moving the sample a set amount in one direction, thereby, automatically moving the sample through the field of view in the microscope. This guide is intended to help technicians and scientists with the setup and use of this instrument (Figure 1).

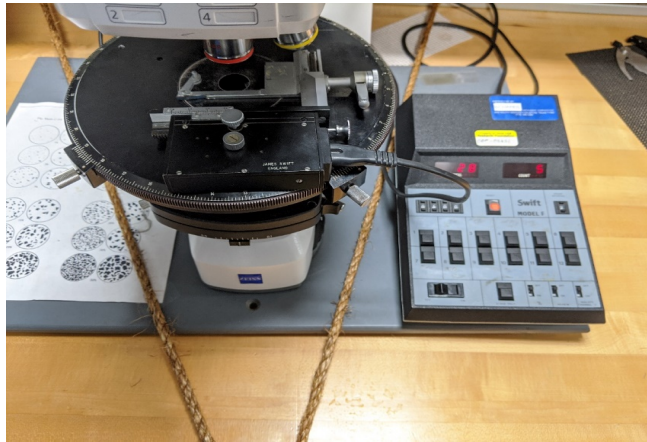


Figure 1: Automatic point counter setup with stage mounted on the microscope stage and attached to a digital counter

Setup and Overview:

The point counters consist of two parts: the stage and digital counter. An electric pulse is sent from the counter to solenoids in the stage, which pulls the spring loaded paddle down and releases the gear to move one click. Users can achieve varying step sizes by changing the gears in stage. Below is a detailed look at the Stage and Digital Counter. For more information on the gears and step sizes, please refer to the section [Gears](#)

The Stage

The Swift/Hacker Stage can be found inside the wooden case below (Figure 2). The case contains the stage, replacement gears for changing the step size, locating screws (not visible in picture), and the screw to attach the unit to the microscope stage (Figure 3).



Figure 2: Wooden case that holds stage.

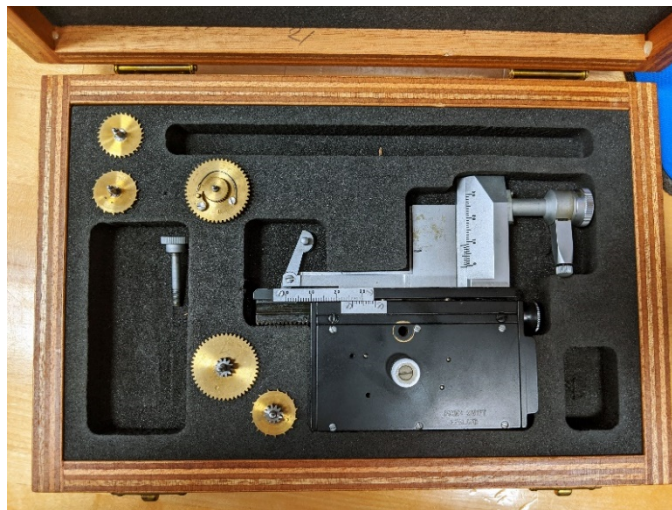


Figure 3: Box open revealing the stage, screw, and a variety of gears.

The parts of the stage are detailed below in Figure 4:

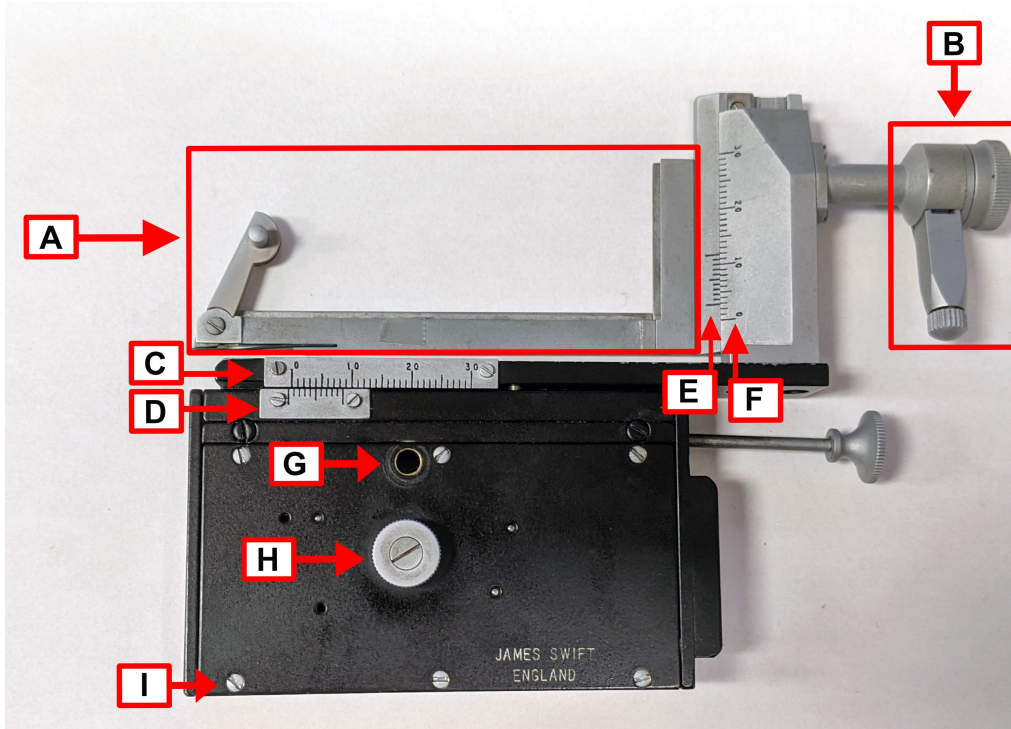


Figure 4: Picture of Swift/Hacker Stage with each part detailed.

1. **Sample Holder:** Slides go in this area. The slide fits into a groove on the vertical and horizontal axis, and secured by the moving lever arm on the left.
2. **Vertical Motion Control:** The wheel and lever can independently control the vertical motion of the slide. The wheel on the right can move the slide both up and down, whereas the lever only moves the slide up.
3. **Moving Horizontal Scale:** Scale bar moves with sample. Tick marks represent 1mm.
4. **Fixed Horizontal Scale:** Scale bar in a fixed location. Tick marks represent 1mm.
5. **Moving Vertical Scale:** Scale bar moves with the sample. Tick marks represent 1mm
6. **Fixed Vertical Scale:** Scale bar in a fixed location. Tick marks represent 1mm
7. **Screw Hole:** Location for screw to mount the unit to the microscope stage.
8. **Horizontal Motion Control:** Locks and releases the horizontal position. Turn counterclockwise to disengage with the gears and release stage to the left. Turn clockwise to engage the gears and can set the location by pulling the stage to the right.
9. **Front Cover Screws:** Six screws holding on the front cover. Take out these screws to remove the front cover and change the gears.

The Digital Counter

The digital counter connects to the stage via a two slot power cable. The counter is detailed below in *Figure 5*:

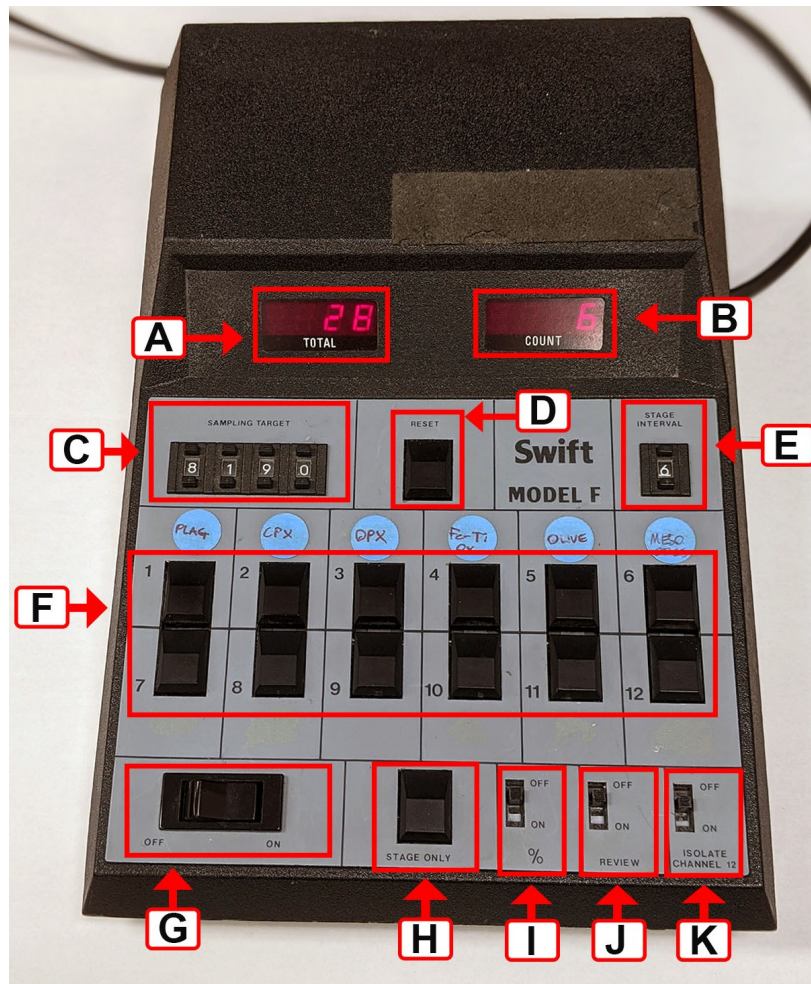


Figure 5: The Digital Counter with each part detailed.

1. **Total:** LED Display of the total number of counts collected in a session
2. **Count:** LED Display of the number of counts for the last selected channel
3. **Sampling Target:** Maximum number of counts per session. Can be set from 0 – 9999. When sampling target is reached an alarm will briefly sound.
4. **Reset:** Resets each channel to 0 counts and the total counts back to zero.
5. **Stage Interval:** Directly correlates to stage movement. Can be set from 0 – 9. A value of 0 will not move the stage at all. A value of 9 will trigger 9 steps by pressing a **channel number** or the **stage only** buttons
6. **Channel Bank:** A selection of up to 12 individual channels. Each channel can be assigned to a unique identifier. In the above example Channel 1 is for plagioclase, Channel 2 is clinopyroxene.
7. **Power Switch:** Controls power to the unit
8. **Stage Only:** This button will only move the stage and not add a count to the total or an individual channel
9. **% Display:** Shows counts as a percentage instead of absolute counts
10. **Review:** Has an on and off state. In the 'off' state the user can make counts against channels. In the 'on' state selecting the channel buttons will show how many counts were recorded.
11. **Isolate Channel 12:** Only applies to channel 12. Has an on and off state. In the off state, counts against channel 12 will update total counts and counts for the channel. In the on state, counts against channel 12 will not update the total counts. Channels 1 – 11 will still update individual counts and the total count.

Installation

Install the stage onto a microscope stage, preferably rotating for more flexibility. The instructions below are for installation onto an A1 Axioscope. Adjustments may need to be made if using a different microscope.

1. Screw two locating screws into the locations shown below (Figure 6). For installation onto other microscopes you may need to move the locating screws. The Swift sample holder offers several options for different stages.

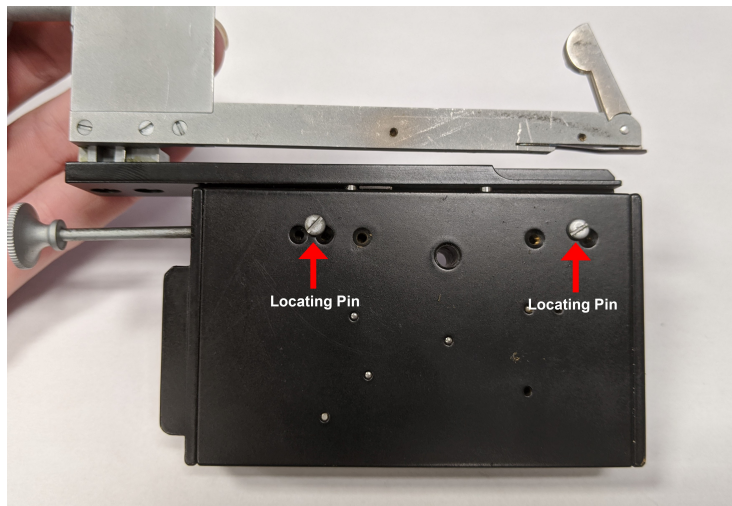


Figure 6: Call outs in red for the locations for locating pins of the back of the Swift/Hacker stag

2. Place the unit onto the stage so the locating pins rest in divets (Figure 7)

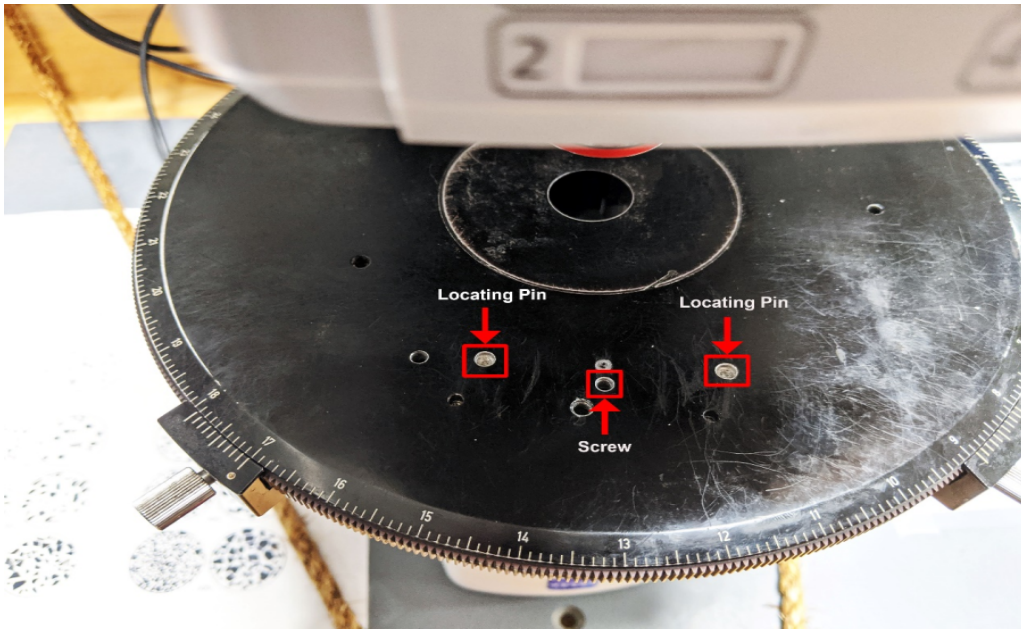


Figure 7: Callouts for the locations of the locating pins and screw on the microscope stage.

3. Take the screw (Figure 8) and screw into the stage (Figure 9).



Figure 8: Screw to secure Swift stage to microscope stage

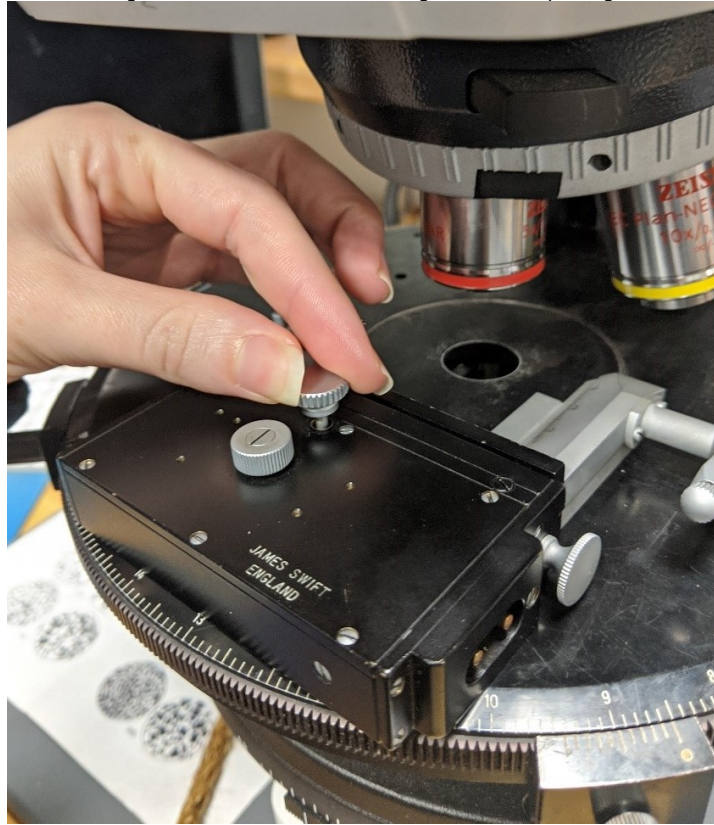


Figure 9: User screwing the Swift stage to the microscope stage.

Connect the stage to the digital counter.

1. Plug the counter into a power source, regulated is preferred.
2. Take the two-slot power cable from the digital counter and plug into the stage (Figure 10)



Figure 10: Two slot power cable from digital counter plugged into stage.

Use

At this point use of the stage and counter will depend on intent and density of the sample.

Mount Slide

1. Place slide in the holder by sliding the sample in the vertical groove (Figure 11).

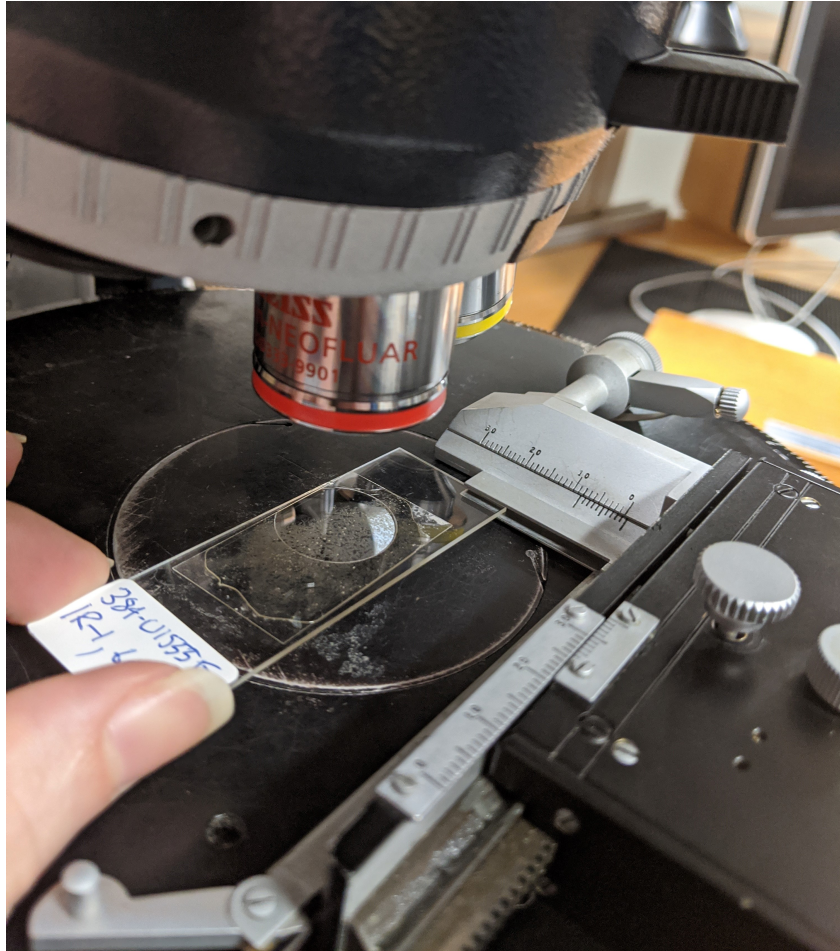


Figure 11: Slide being placed in the sample holder.

2. Secure the slide by moving the lever arm in so it holds the slide in place (Figure 12).

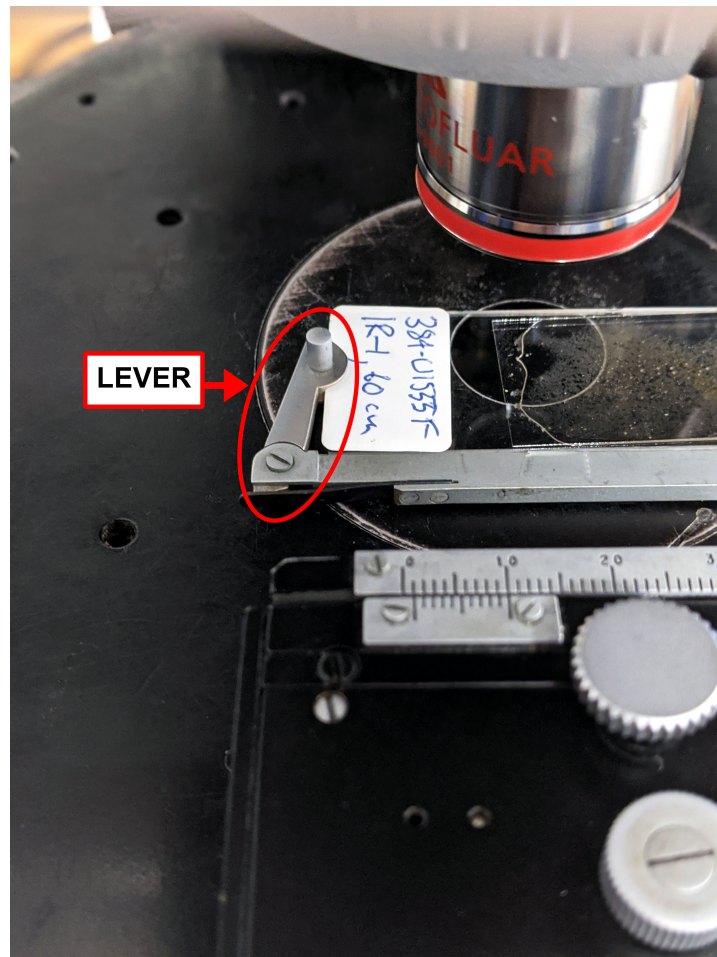


Figure 12: Lever arm securing sample

Adjust Horizontal Position

The horizontal position of the sample will need to be set when first looking at a sample and when everything in the current x-y axis has been observed. Adjust the horizontal location so the left-most portion of your sample is in the field of view. As a reminder the counter only moves the sample to the left.

1. Turn the knob counterclockwise to release the gears and allow the holder to slide over to the left (*Figure 13*). The stage will start to move to left on its own and you should be able to move the stage freely right and left, but it will not stick yet.

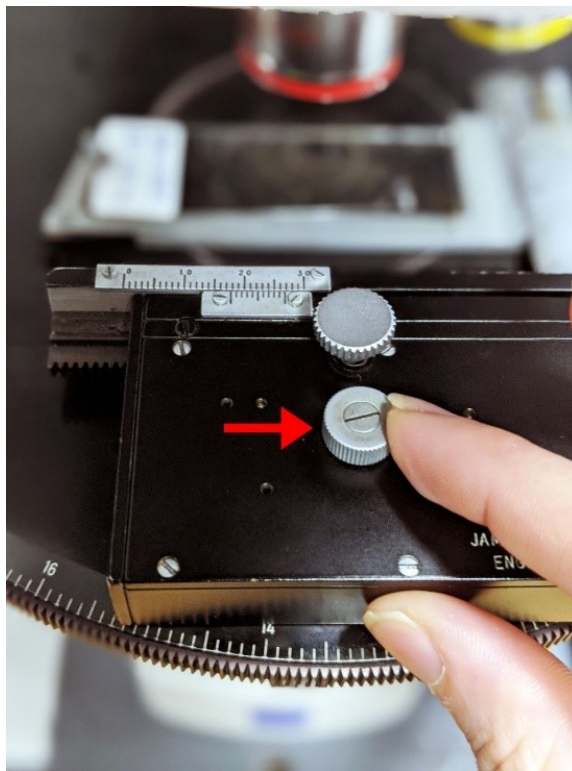


Figure 13: Knob being turned counterclockwise.

2. Turn the knob clockwise to re-engage the gears. Now the position will not slip to the left anymore and the stage can be pulled to the right to the desired location (Figure 14). A good starting place is to line up the '0' hash mark on the first hash mark of the fixed scale bar, however this will depend on the sample being observed.

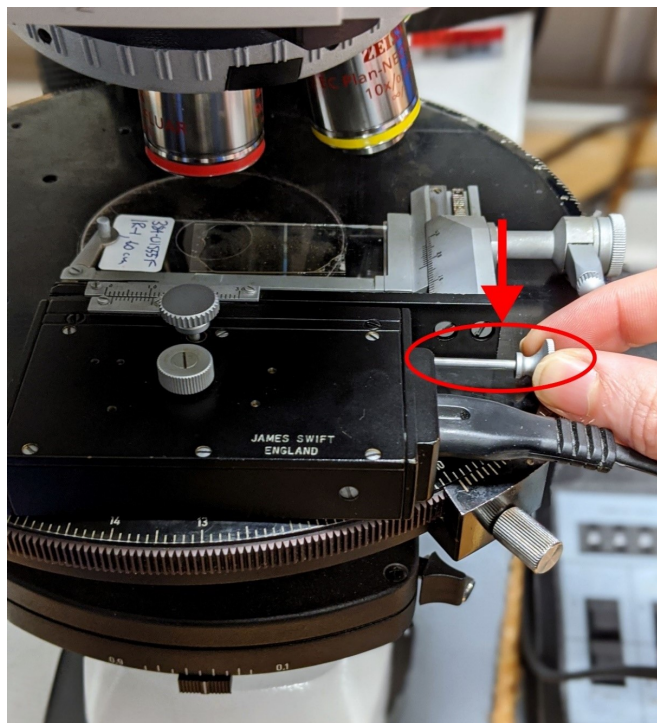


Figure 14: Rod being pulled to move the horizontal axis back to the right.

Adjust Vertical Position

Adjust the vertical position when first looking at a sample and when all observations have been made in the current x-y plane. The user must manually set the vertical position each time. The standard motion is for the slide to move up, so it is recommended to start in the top corner of the slide.

The position can be set by using either the wheel or the lever, illustrated in Figure 15. The wheel and lever will both move the sample up by 0.2 mm with each click. This step size cannot be altered.

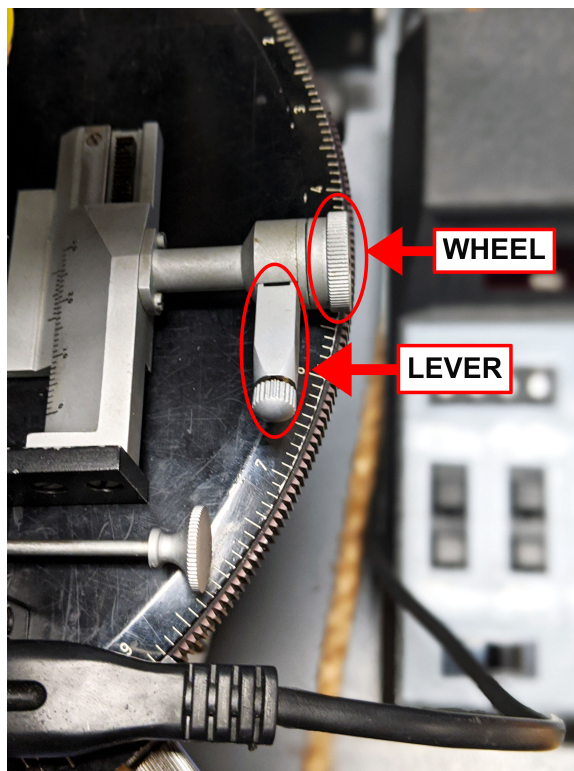


Figure 15: Call outs for the location of the wheel and lever.

Wheel Adjustments

Set the position for the first time using the wheel. The wheel allows for faster and larger adjustments. Turn the wheel towards you, counterclockwise, and the holder will move up (Figure 16).



Figure 16: Wheel being turned to move sample up.

To move the holder down or to make larger steps pull the knob at the end of the lever (Figure 17). There is a small pin that typically rests inside a slot. Turn the knob and release so that the pin is outside the slot. The wheel can now be turned freely clockwise or counterclockwise. This is the only way to move the sample down.



Figure 17: Knob being pulled out of the lever. The pin is shown by the red callout.

Lever Adjustments

The lever is a good way to move the stage in incremented steps while observing the sample. Push down on the lever and then release, the stage will move up in 0.2 mm increments, shown in Figure 18 and Figure 19 below. If the lever does not return all the way, push up on the lever and you will hear the click and observe movement.



Figure 18: Lever not depressed.

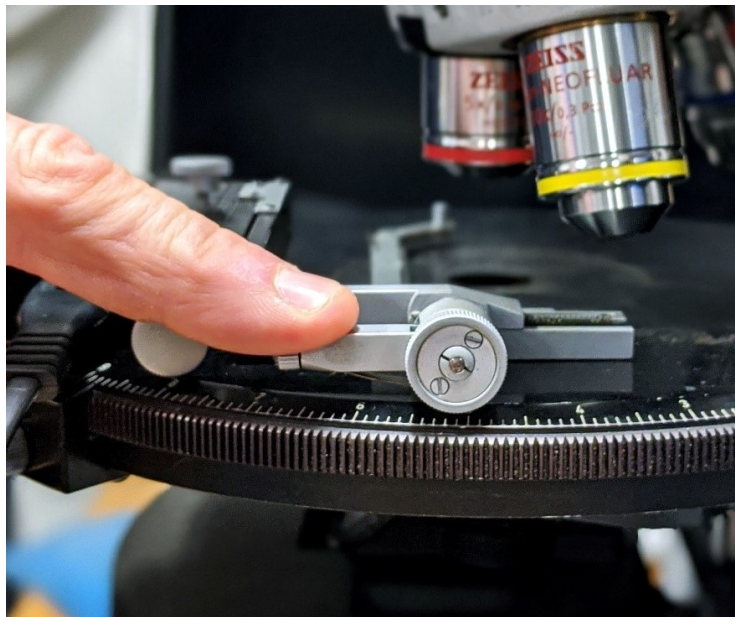


Figure 19: Lever depressed.

Counting Samples

1. Turn the power to digital counter on using the power button outlined in red below (Figure 20)



Figure 20: Power button highlighted in red.

2. Assign up to 12 unique identifiers to each channel by writing on a label and sticking above or below the channel button.
3. The number displayed in the **Total** display should read 0. If not, press the Reset button.

The stage will move when triggered by the digital counter. There are two ways to trigger motion, use the appropriate method for your application and counting intent.

A. Stage movement with every count: Set the stage interval between 1 and 9. If the Stage Interval is set to 1, the stage will move one click every time a button is pressed. If the Stage Interval is set to 9, the stage will move 9 clicks. The absolute step size is dependent on the combination of gears inside the holder.

B. Stage movement after everything of interest has been counted: Set the Stage Interval to 0. Count everything of interest. When ready for the field of view to change, adjust the stage interval to a value between 1 and 9 and click the Stage Only button. This moves the stage without registering a 'count' to the total or an individual channel's count.

Gears

Each gear has a unique letter printed on itself. These letters are used to refer to the gear of interest in this guide. Either three or four gears can be used with three gears resulting in larger steps and four gears resulting smaller steps. The gear type and location are specific so refer to the table and pictures in this section when swapping gears.

Gear Combinations

The gears can be changed to adjust horizontal step size. There are four combinations of gears that result in different step sizes of 0.3 mm, 0.16mm, 0.1 mm, and 0.05mm. The absolute movement can be increased by increasing the stage interval on the digital counter, which acts as a multiplier of the step size. For example a step size of 0.3 and a stage interval of 5 will move the stage 1.5mm with the press of a button. Refer to *Table 1* for reference on gear combination and step size.

Gear Combination	Fractional Step size (mm)	Decimal Step size (mm)
ABC	1/3	0.33
ABG	1/3	0.33
ABD	1/6	0.16
ABH	1/6	0.16
AEFC	1/10	0.1
AEFG	1/10	0.1

AEFD	1/20	0.05
AEFH	1/20	0.05

Table 1: List of gear combinations and associated step sizes.

The gears and gear locations are specific change between the three and four gear setups. The two options are illustrated below in *Figure 21* and *Figure 22*. The circles represent the gear locations and the letter corresponds to the letter stamped on the gear. Note that in both the three and four gear arrangement there are four letters associated with one location. These are all the possible gears that could go in that location.

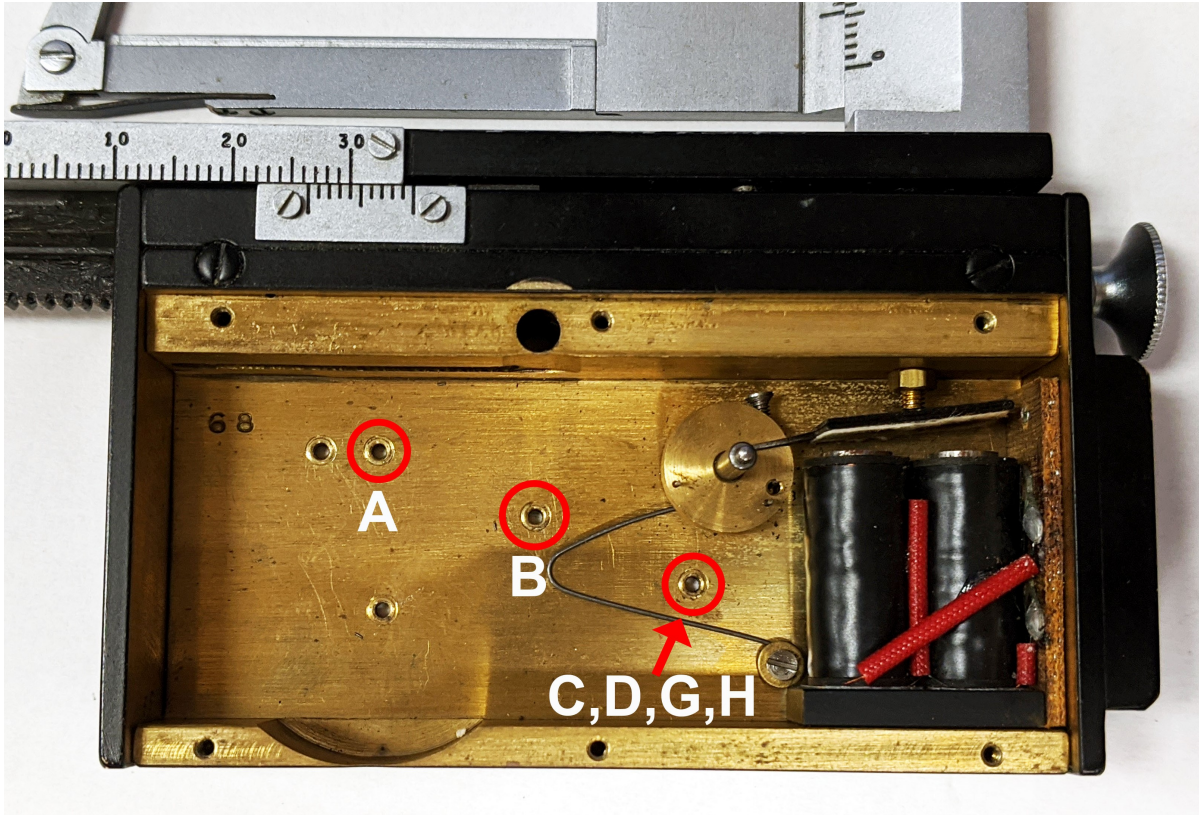


Figure 21: Layout of the three gear combination. The location of Gear A and Gear B are called out. Third gear location could be used with gears C,D,G, or H.

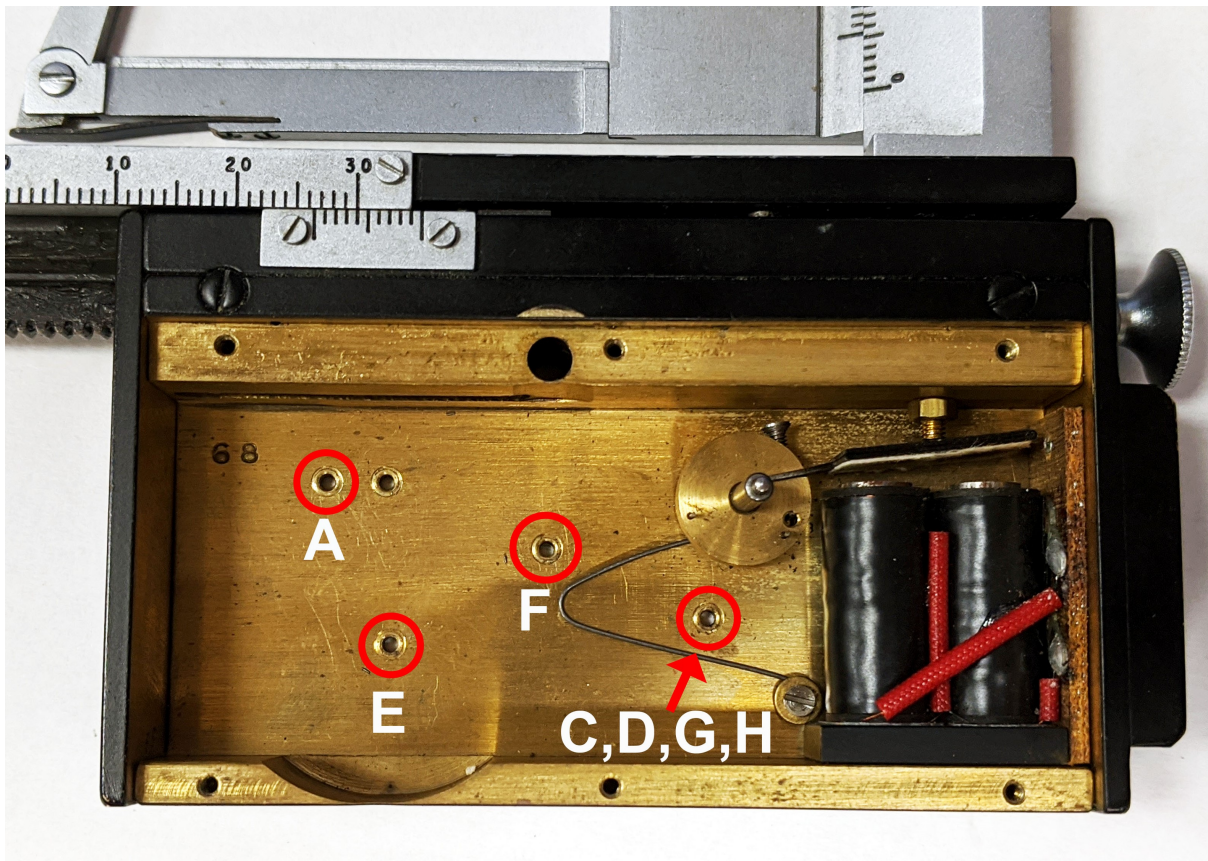


Figure 22: Layout of the four gear combination. The location of Gear A, E, and F are called out and fixed. The fourth gear location could be used with gears C, D, G, or H.

Change Out Gears

1. Grab a flathead screwdriver and remove the six screws attaching the front plate to the unit (Figure 23).

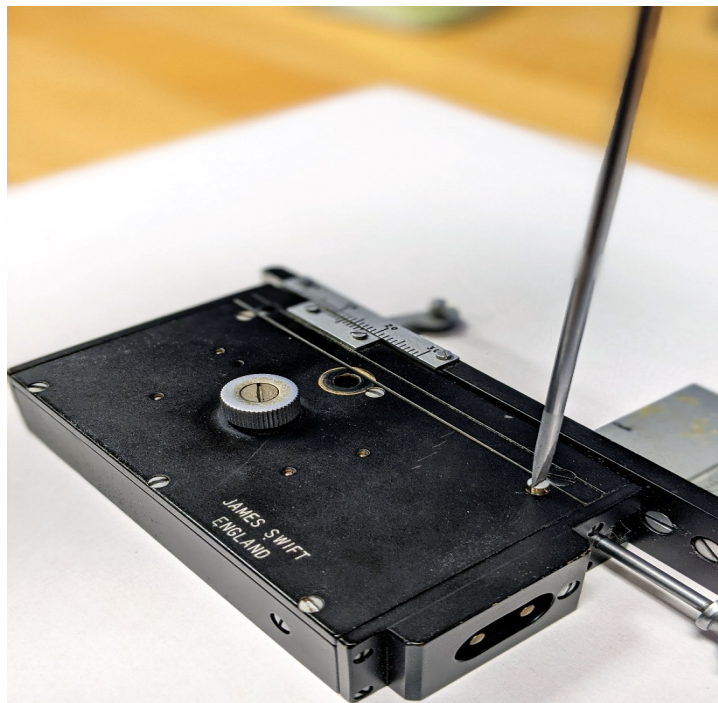


Figure 23: Taking out screw.

2. Pull up the plate by the center knob (Figure 24).



Figure 24: Front plate being lifted off.

3. Now you see the inner workings of the stage (Figure 25). Gears can be lifted out as desired and replaced with a combination listed above. When reattaching the front plate you may need to move the horizontal bar back and forth to get the plate to engage properly with the gears. Do not remove the wheel with the attached paddle. The wheel is connected to a spring and engages with the solenoid.

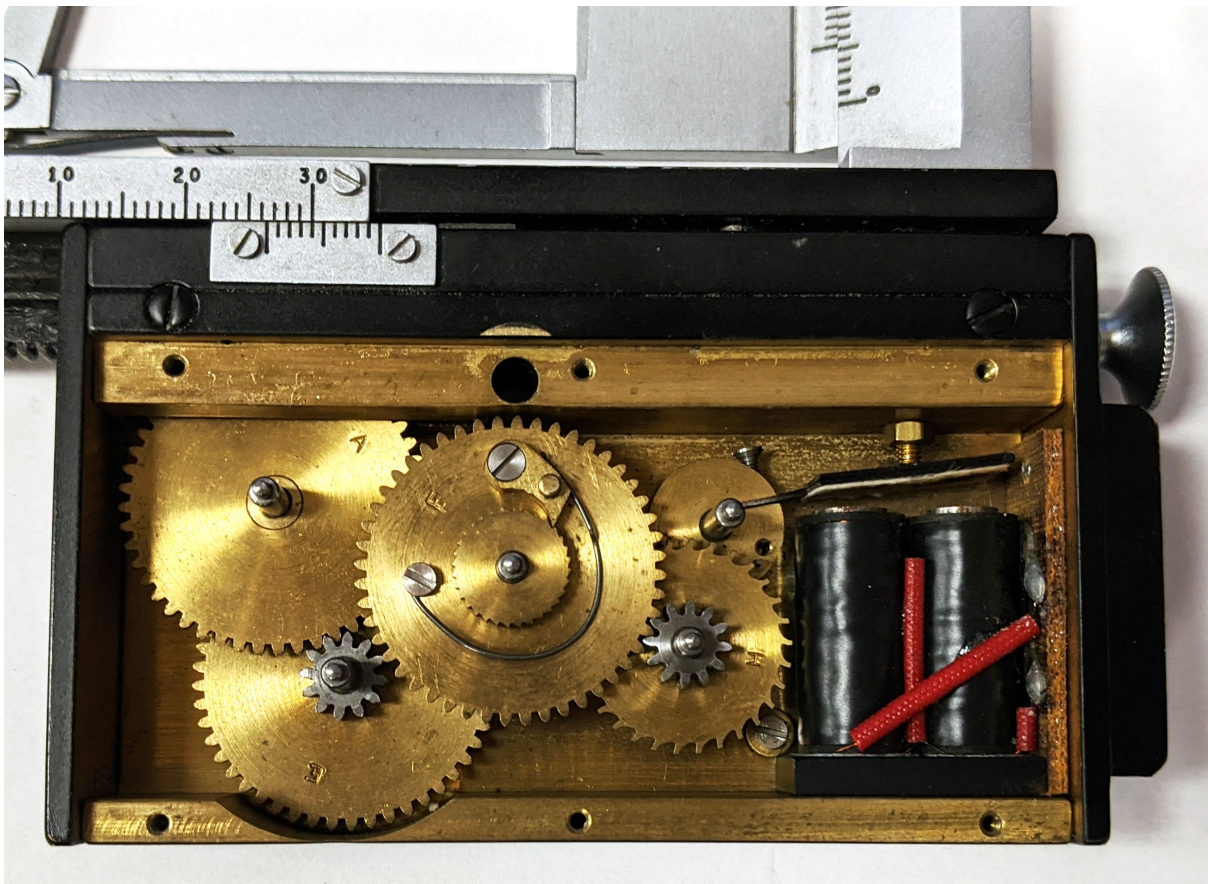


Figure 25: Stage with front plate removed, revealing the gears and solenoids.

Gear Setup Examples

Three gear large step (Figure 26).

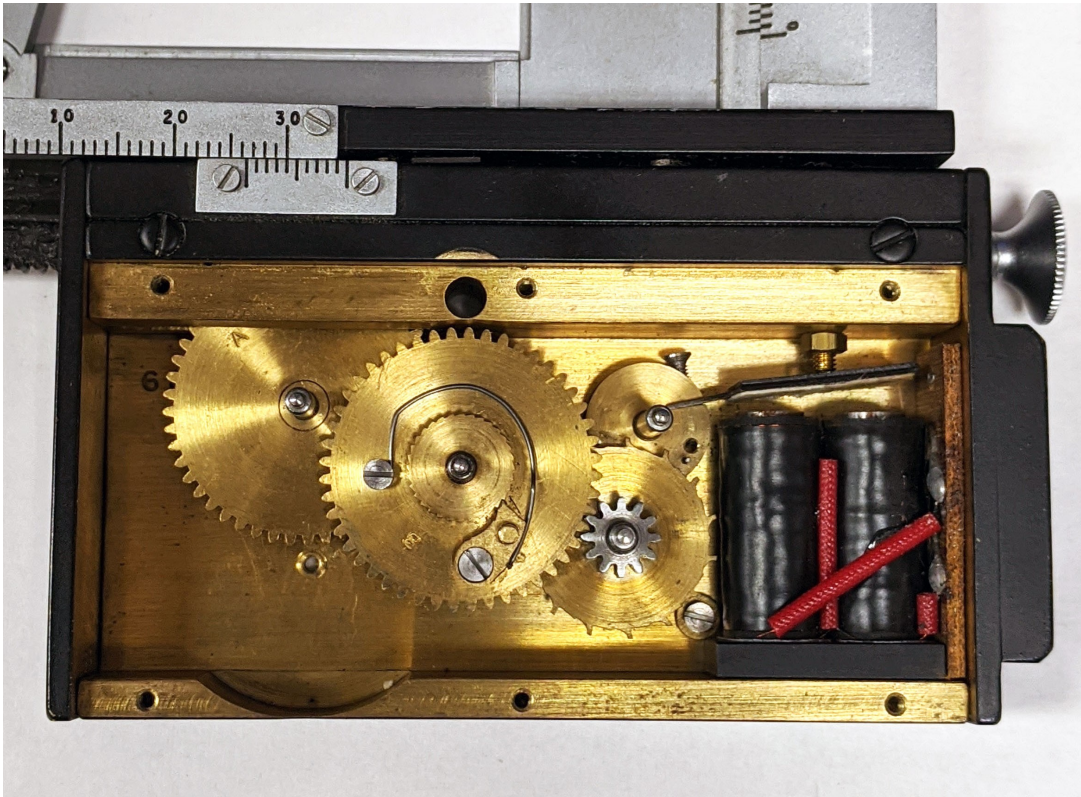


Figure 26: Three gear arrangement to produce a 1/3 mm step.

Three gear small step (Figure 27).

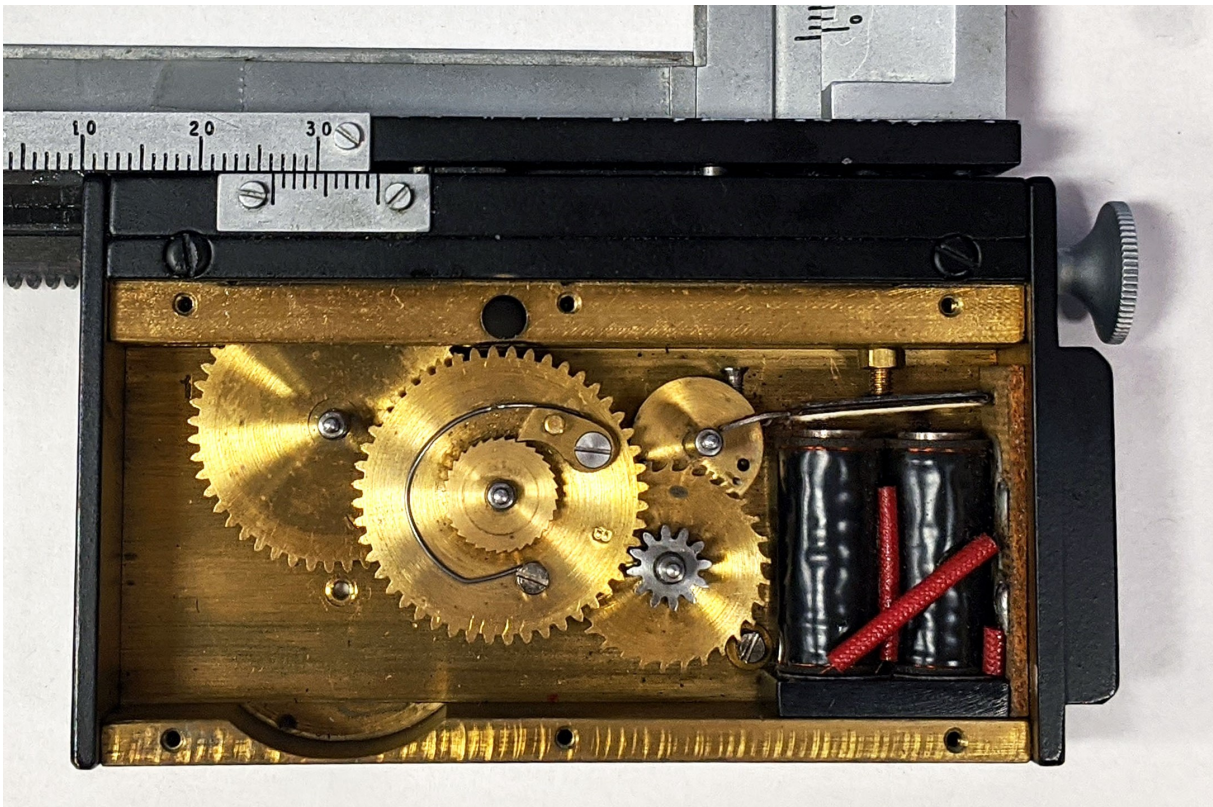


Figure 27: Three gear arrangement to produce a 1/6 mm step.

Four gear large step (Figure 28).

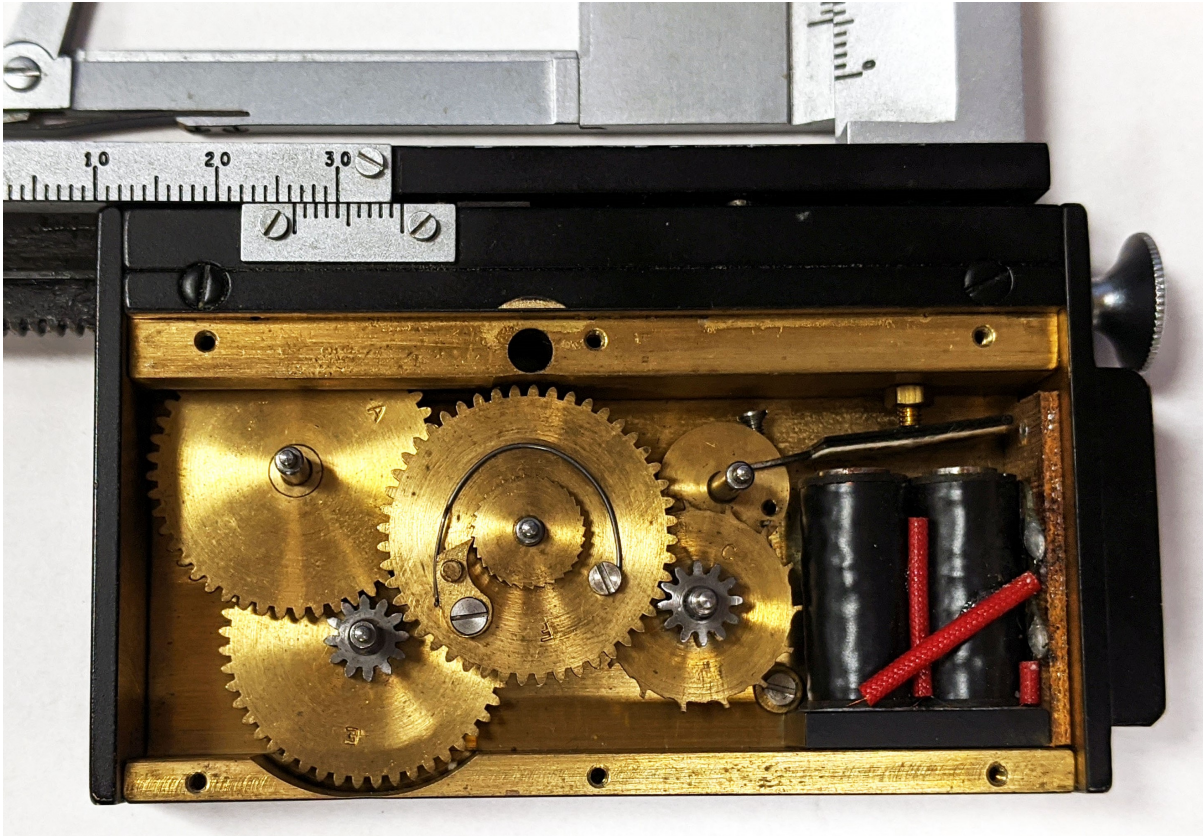


Figure 28: Four gear arrangement to produce a 1/10 mm step.

Four gear small step (Figure 29):

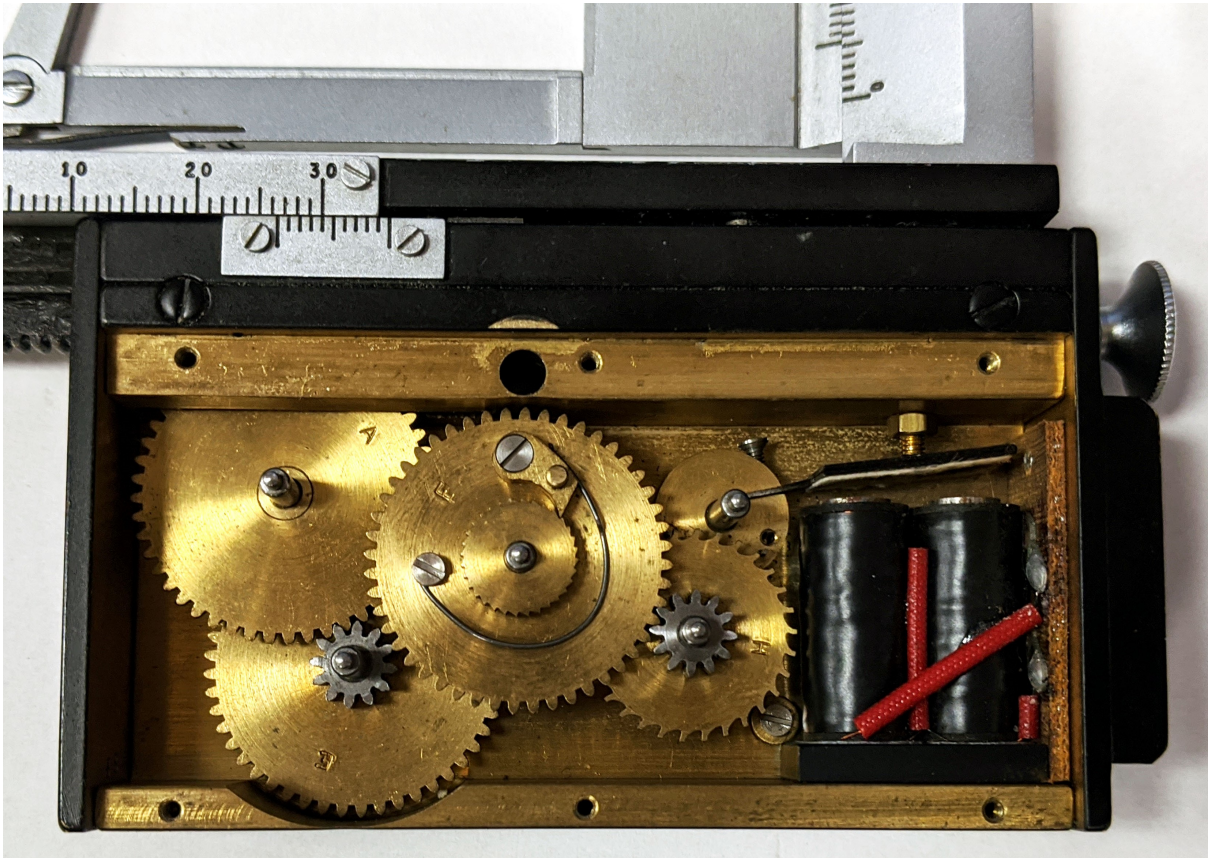


Figure 29: Four gear arrangement to produce a $1/20$ mm step.

