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THE FILM PROJECTOR

What is a movie projector?

A movie projector is a mechanical device used for showing motion pictures. Movie projectors transfer movie images from rolls of film onto a viewing surface like a screen. It functions by continually moving film reels on its wheels known as sprockets which are powered by an electrical motor. By moving like a conveyor belt, the film will play from start to finish. The reel also has to move fast for the film to have motion, no less than 24 frames per second to make the human eye think the still film frames are moving.

When was the first movie projector invented?

British photographer Eadweard Muybridge invented the first movie projector model in the year 1879, the Zoopraxiscope, which created motion by rapidly projecting images from rotating glass disks. When Muybridge used them in his public lectures from 1880 to 1895, the projector used 16” glass disks with the sequences painted as silhouettes, eliminating the backgrounds and allowing additional imaginary elements. In 1892-1894, a later series of disks used outlines done by illustrator Erwin F. Faber which were photographically printed onto the disks and colored by hand. The Zoopraxiscope was the predecessor of the motion picture.

Figure 1(above): A zoopraxiscope from 1893.

The first successful movie projector, the Cinematograph, was created by the Lumiere brothers Auguste and Louis, based on the work of French inventor Leon Bouly who could not develop his ideas properly due to a lack of money. The cinematograph was built to create the motion-picture camera to rival American inventor Thomas Edison's kinetoscope. No, it wasn't a movie projector, it did introduce the approach that would later become the standard for film projection before video was invented. The Lumiere brothers sought to fix what they perceived as flaws with Edison's invention as well as create a machine with both better lighting and sharper images. Unlike the kinetoscope, which was electrically powered and not portable, the cinematograph weighed 16 pounds and was manually operated by a hand crank. Additionally, the cinematograph could project an image onto a screen so a large audience could view images simultaneously.

Figure 2(above): Cinematographe Lumiere, the brothers' projectors.

Principle components of a movie projector:

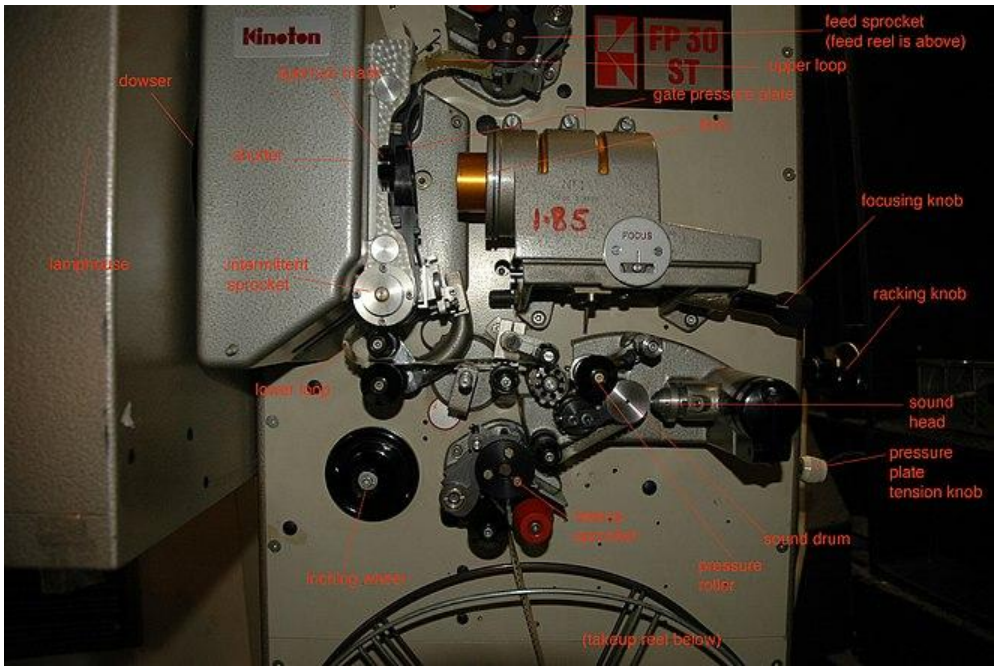
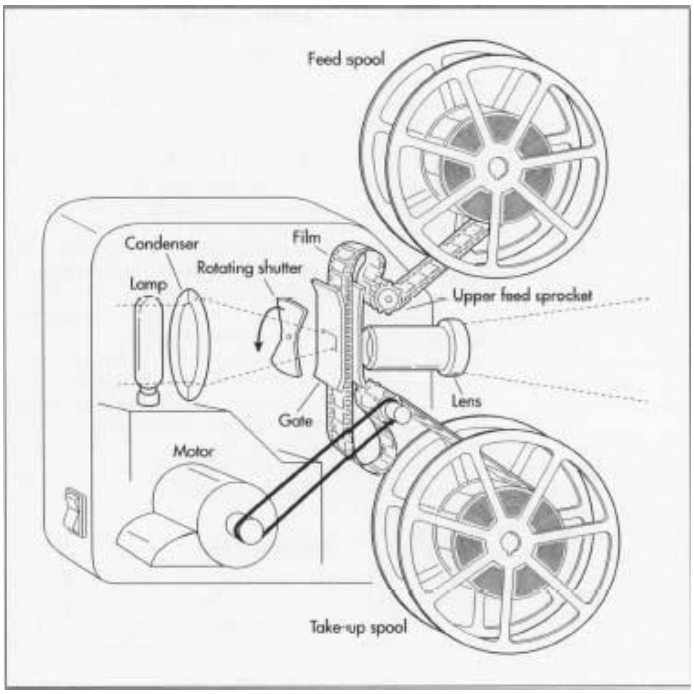


Figure 3(left): Labeled parts for a 35mm Kinoton FP30ST movie projector, for example.

1. All movie projectors required a light source, the key element no less. At first, carbon arc lamps were used since the early 1900s. However, these have a very short lifespan. Today, we commonly use Xenon bulbs. The rare gas Xenon conducts electricity in dense enough qualities glows very brightly as a conductor and continues to provide bright illumination for a substantial amount of time ranging from 2,000 to 6,000 hours.
2. The bulb is mounted in the center of a parabolic mirror located in the lamphouse which reflects light from the bulb and focuses it on a pair of lenses called a condenser, which are used to further intensify the light and center it on the main lens assembly.
3. When the focused light leaves the lamphouse and enters the projector, it is intercepted by the shutter, this small propeller-like device that rotates 24 times per second. The blades block out the path of the light as it comes to a certain point, and the resulting blacking out works in sync with the film's movement so the light doesn't project a fraction of a second when the frames of the film move forward. Most projectors used double shutters to reduce the possibility of flicker by having the light to be cut off from both the top and bottom of each frame.
4. The last stop for the light to get to the film is the aperture gate. The gate is a small removable metal frame that blocks the light to illuminate only the part of the film you want to be seen on the screen. From there, the light can pass through the film and into the main lens.



As for the film, it starts by getting docked onto sprockets, gear-like wheels. Powered by an electric motor, the sprockets pull the film through the projector, allowing the film to advance at a rate of 24 frames per second. When the film begins to finish, it gets spooled to a take-up platter.

Figure 4(left): diagram of a movie projector's parts

Conclusion:

Over time, humanity has, and will still be striving to, become more and more technologically advanced. The original concept of the motion picture which led to the wide expanse of media we have today qualifies as an example, given its history that led to the cinematograph and many improvements to come. Humanity has found new solutions to improve and simplify work in the past and I can predict more to come in our future.

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