A. S. HOWELL.

SPLICING APPARATUS FOR CINEMATOGRAPHIC FILMS.

APPLICATION FILED NOV. 27, 1916.

1,275,431.

Patented Aug. 13, 1918.

8 SHEETS—SHEET 1.

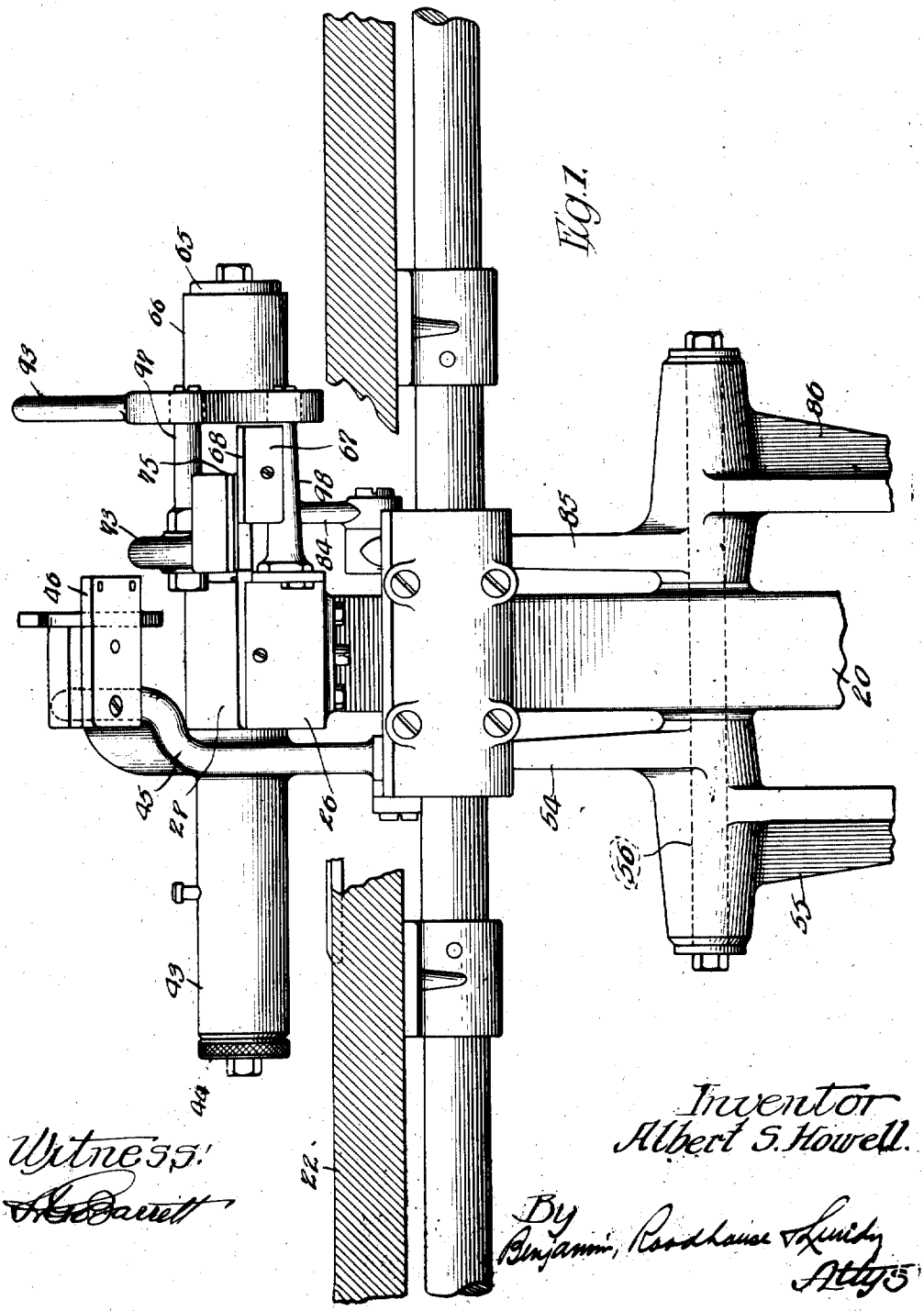


Fig. 7.

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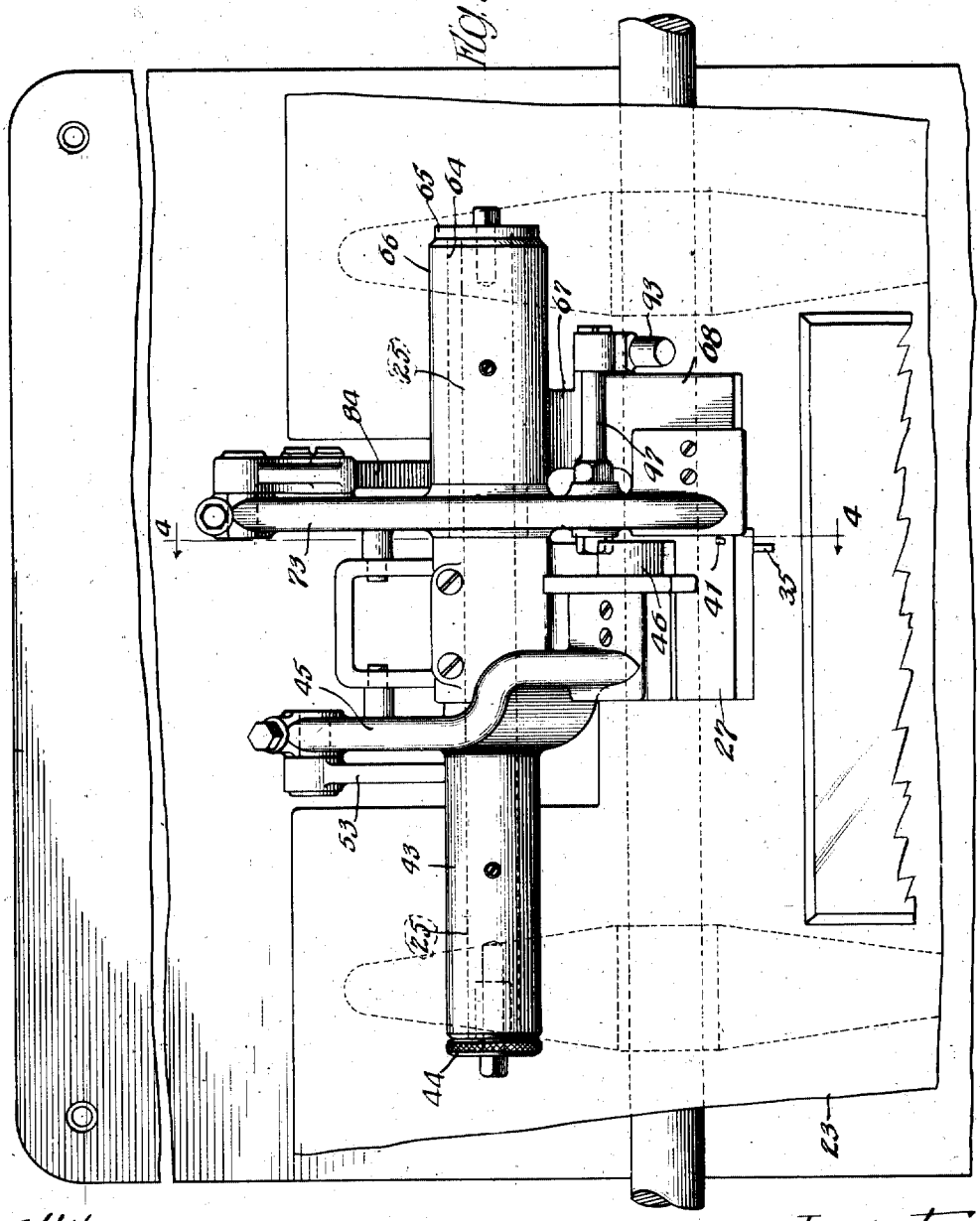
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8 SHEETS—SHEET 2.

FIG. 2.



Witness

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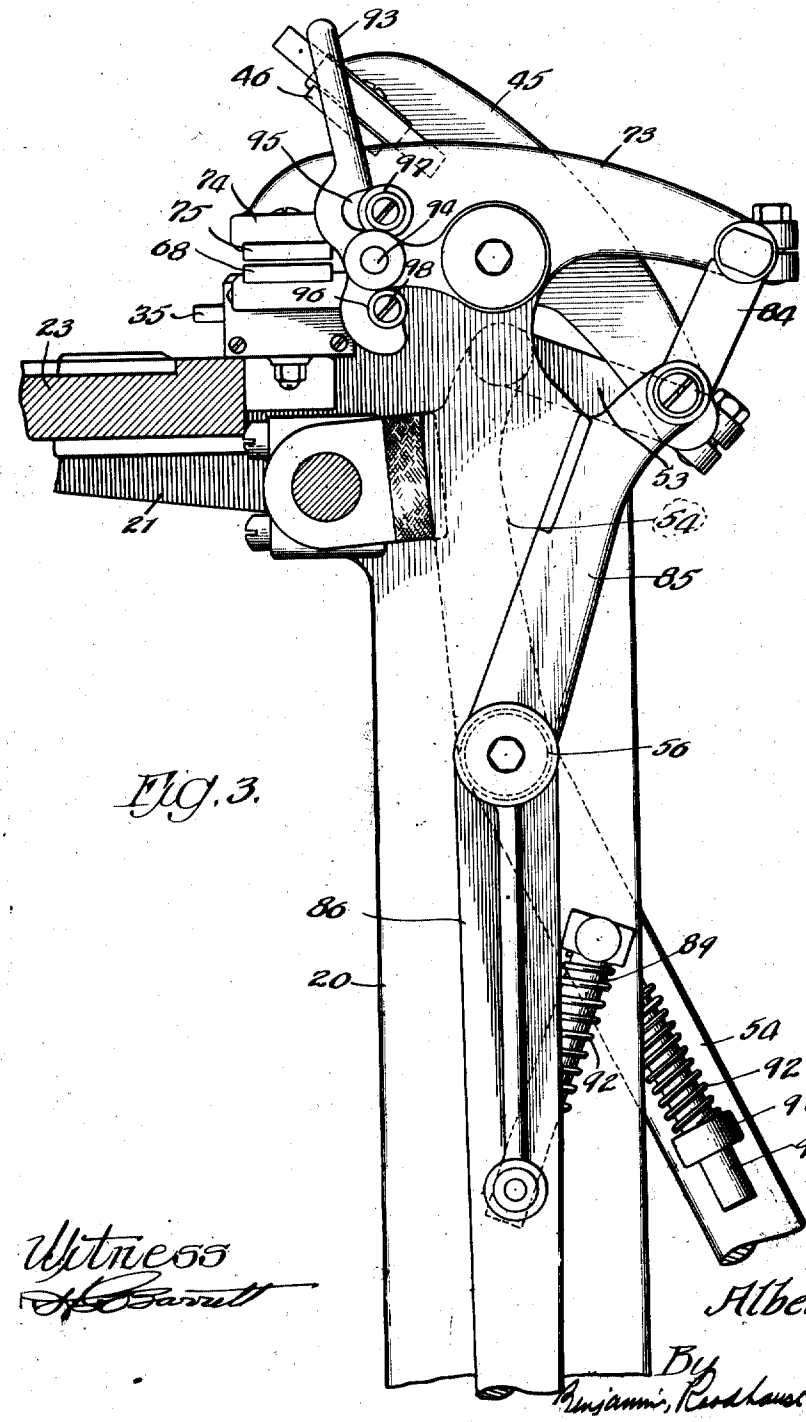


Fig. 3.

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8 SHEETS—SHEET 4.

Fig. 4.

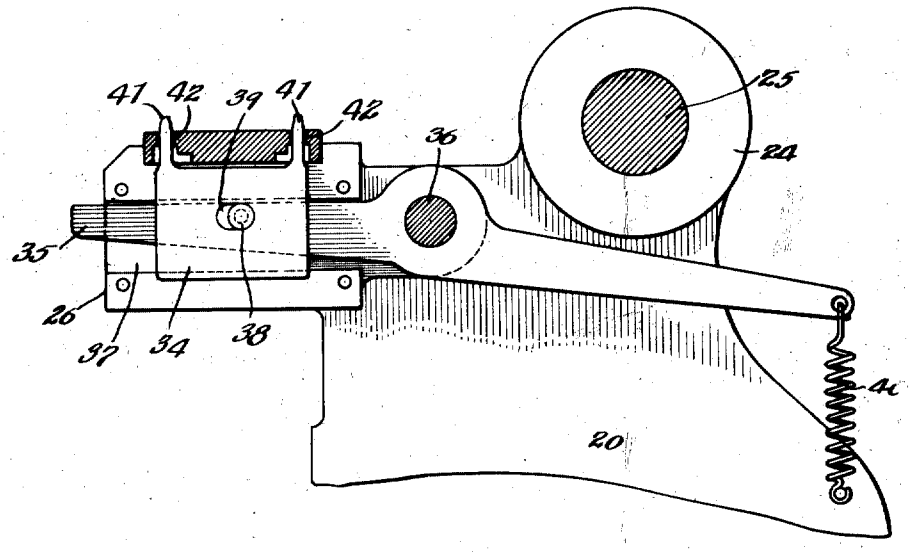
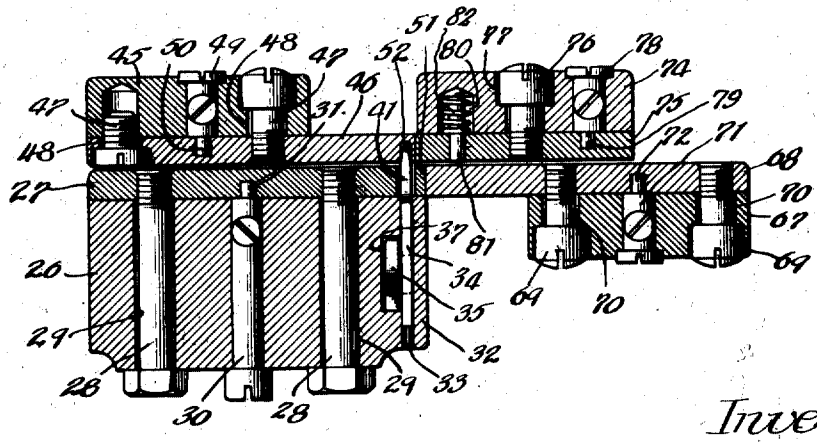


Fig. 5.



Witness

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8 SHEETS—SHEET 5.

Fig. 6.

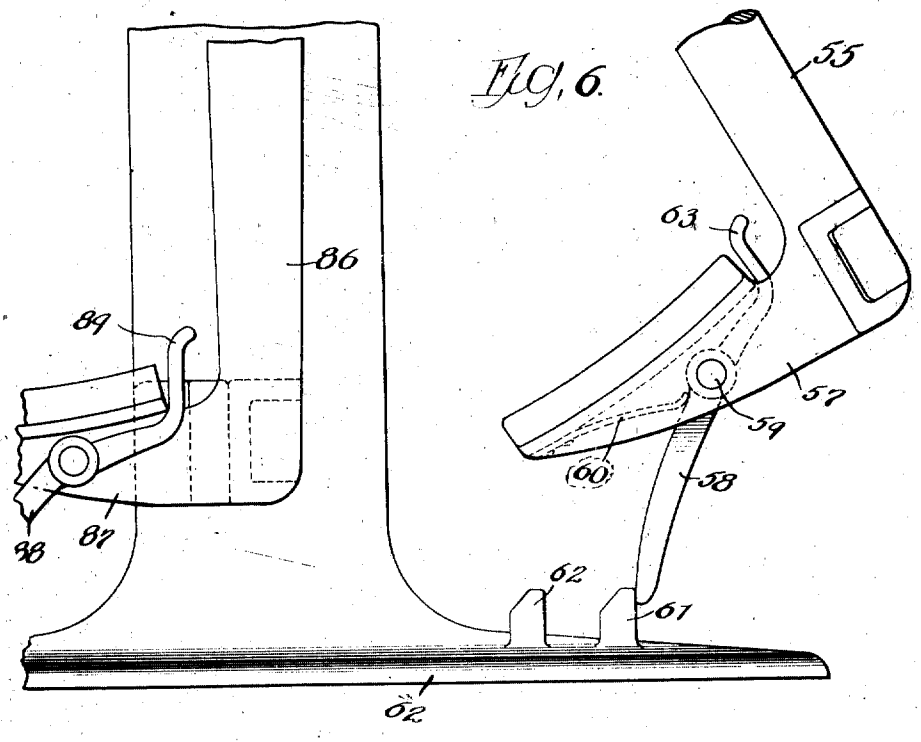
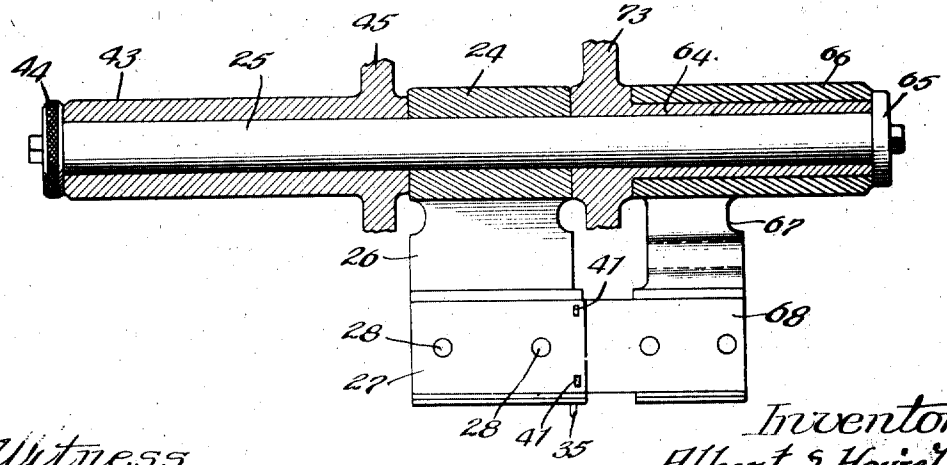


Fig. 7.



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8 SHEETS—SHEET 6.

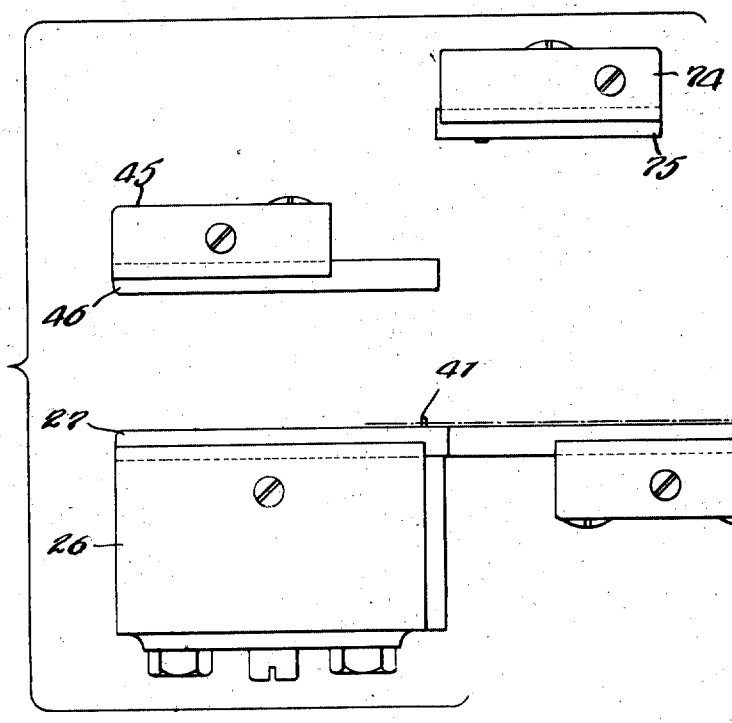
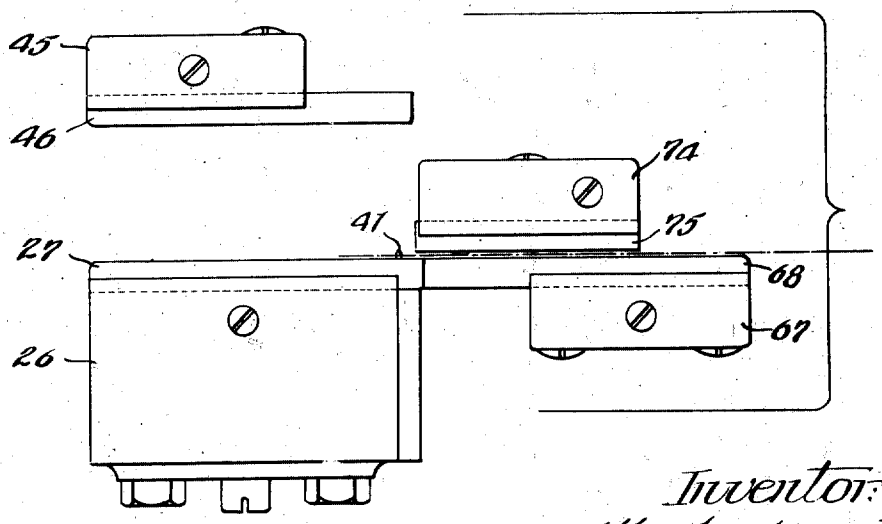


Fig. 8

Fig. 9.



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8 SHEETS—SHEET 7.

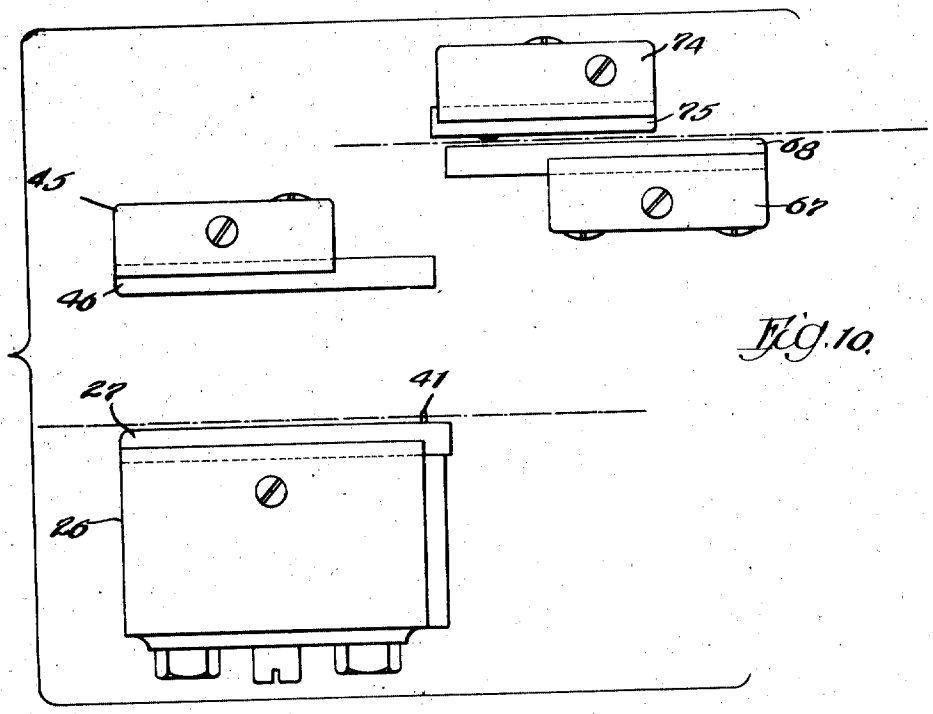


Fig. 10.

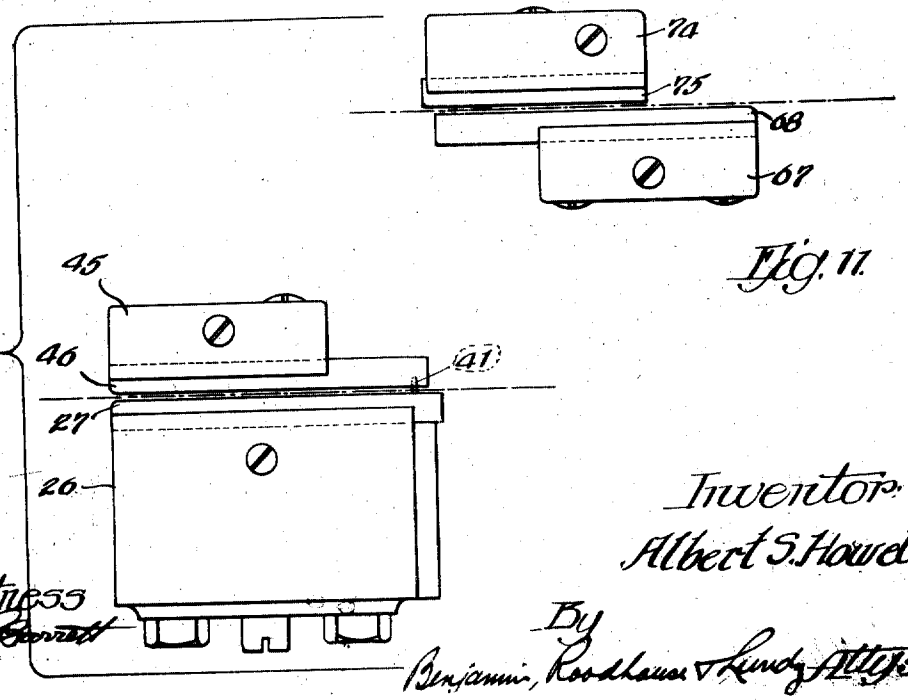


Fig. 11.

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8 SHEETS—SHEET 8.

Fig. 12.

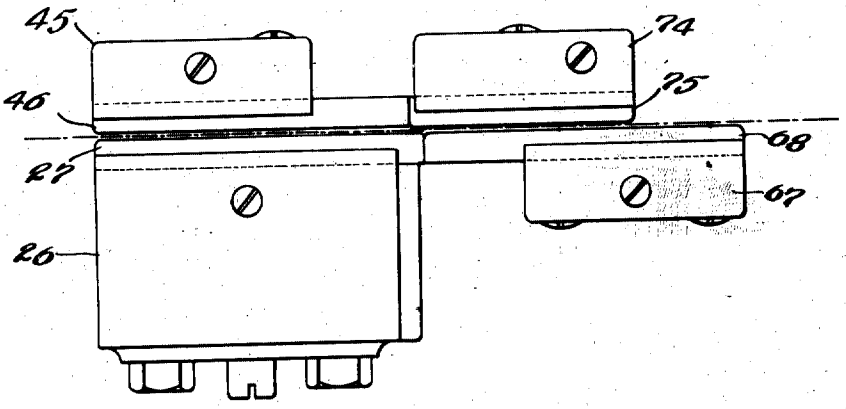


Fig. 13.

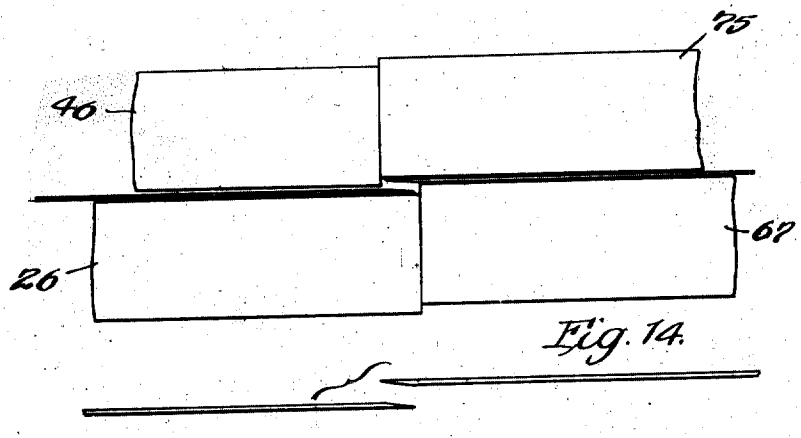


Fig. 14.

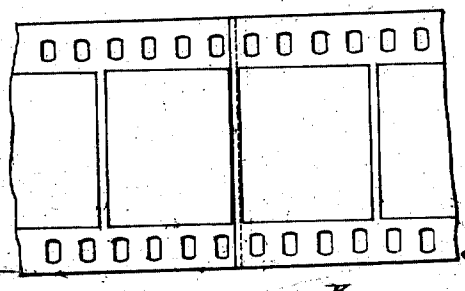


Fig. 15.

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UNITED STATES PATENT OFFICE.

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SPLICING APPARATUS FOR CINEMATOGRAPHIC FILMS.

1,275,431. Specification of Letters Patent. Patented Aug. 13, 1918.

Application filed November 27, 1916. Serial No. 133,770.

To all whom it may concern:

Be it known that I, ALBERT S. HOWELL, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Splicing Apparatus for Cinematographic Films, of which the following is a specification.

My invention relates to apparatus for splicing the ends of strips of cinematographic film whereby a plurality of strips of film bearing scenes and titles may be rapidly and accurately joined together to provide a continuous film strip of considerable length.

It is one of the objects of my invention to provide an apparatus of this character that may be so adjusted that the ends of the strips which are to be spliced or joined may be brought into exact register with each other so that the marginal perforations of the finished strip of film will not vary nor the distance between said perforations be changed at the location of the splice. A further object of my invention is the provision of a splice for cinematographic film that is adapted to accurately shear the end edges of the strips to be joined and at the same time provide a portion of said film to be overlapped when the splice is made. Another object of my invention is the provision of a splicing machine with which it is possible to make a splice which will not be thicker than the unspliced portion of the film. Other objects of my invention are the provision of a film splicer that is capable of performing its functions with greater rapidity and accuracy than is possible with the means at present in use, and also to provide an apparatus of this character that is simple and easy to manipulate, comparatively inexpensive to manufacture, and is assembled with as few operating parts as possible so that it will not readily get out of order.

I prefer to accomplish the divers objects of my invention by substantially the means and in the manner hereinafter fully described and as more particularly pointed out in the claims, reference being had to the accompanying drawings forming a part of this specification, in which similar reference characters are employed to designate like parts throughout the several figures thereof.

In the drawings,—

Figure 1 is a vertical front elevation partly in section of the upper portion of my machine for splicing cinematographic film.

Fig. 2 is a top plan thereof.

Fig. 3 is a vertical side elevation of my invention, the table being shown in section.

Fig. 4 is a transverse vertical section taken on line 4—4, Fig. 2, and drawn to an enlarged scale.

Fig. 5 is a longitudinal vertical section of the clamping members detached from the apparatus and drawn to an enlarged scale.

Fig. 6 is an enlarged detail side elevation of the foot lever mechanism adjacent the bottom of the standard.

Fig. 7 is a horizontal, longitudinal axial section of the bearings for the arms carrying the clamping members.

Figs. 8, 9, 10, 11 and 12 are diagrammatic views of the successive steps in the operation of the apparatus in cutting and splicing the ends of the film.

Fig. 13 is an exaggerated diagrammatic view of the final step of the operation and just prior to pressing the overlapped edges of the film together.

Fig. 14 is an edge view of the two strips of film about to be united.

Fig. 15 is a top plan of the film after being spliced or united.

Referring to the drawings, it will be seen my apparatus preferably comprises a suitable vertical standard 20 that is provided with laterally projecting horizontal arms 21 adjacent its upper end and has its lower portion terminate in a suitable flat base 22. A suitable flat table or shelf 23 is supported by the arms 21 to provide a rest for the operator. Standard 20 extends above the horizontal plane of the table just mentioned and preferably terminates in a suitable transverse boss 24 that provides a bearing for the horizontally disposed arbor 25 upon which the pivotal ends of the film clamping members are carried, as will be hereinafter more fully described.

Projecting horizontally from the upper portion of the standard 20 and in front of the arbor 25 is a suitably shaped extension 26 that has the lower plate 27 of one of the film clamping jaws mounted thereon. This plate is preferably of rectangular shape in

outline, with a smooth upper surface and is secured to said extension by elongated bolts 28, 28, that pass through smoothly bored openings 29, in said extension and have their upper ends tapped into threaded openings in said plate 27. The diameters of the openings 29 are slightly greater than the widest diameter of bolts so as to permit of slight adjustment of said plate 27, and in order to accomplish this adjustment I have provided a smooth bolt 30, that is inserted through the extension and is provided upon its inner end edge with a longitudinally projecting stud 31 that is disposed eccentrically of the axis of said bolt so as to engage a suitable recess formed to receive the same in the lower bottom surface of the plate 27, as shown in detail in Fig. 5 of the drawings. An end plate 32, having a large recess or depresssion 33 upon its inner face, is bolted or otherwise suitably secured to the righthand end surface of the extension 26, and a vertically reciprocable rectangularly shaped blade 34 is disposed in the recess or depression *ss*, so that it will be guided by the ends of said depression between the inner surface thereof and the opposing surface of the extension 26. A lever 35, fulcrumed intermediate its ends upon a stub 36 projecting from an adjacent portion of the standard, has its forward end extended through a longitudinally elongated guideway 37 made horizontally in the extension 26, and is provided with a lateral finger 38 that projects into and engages a horizontally disposed elongated slot 39 in said blade 34. The opposite end of lever 35 is kept normally depressed by a suitable coiled contraction spring 40, so that the blade 34 will be normally at the upper limit of its movement. Suitable film-engaging teeth 41, 41, extend upwardly from opposite ends of blade 34 and project through suitable small corresponding openings 42, 42, made in the face plate 27, and whenever the adjacent extended end portion of lever 35 is sufficiently depressed, these teeth 41 will be withdrawn through their respective openings so as to disengage the film. The teeth 41 correspond in cross-section to the shape of the usual perforations adjacent the margins of a film strip and the distance between said teeth corresponds with the distance between perforations upon opposite margins of the film so that said blade will be disposed transversely across the film, as will be understood.

Mounted upon the arbor 25, preferably at the left of the boss 24, is a suitable sleeve, 43 that is elongated and extends to the adjacent end of said arbor where it is retained against accidental removal by a flanged nut or bolt 44, while next the boss 24 said sleeve is provided with an integral arm 45, that projects both to the front and rear thereof. The forwardly extended portion of this arm is somewhat irregular in shape in order that its end will terminate in substantially vertical alinement above the plate 27. A plate 46 is preferably mounted upon the underside of the outer end of this arm 45 by bolts 47, 47, in substantially the same manner as plate 27 is secured to its support by providing smooth bores in the bolt openings 48, 48, that are wider than the diameters of the corresponding portions of the shanks of the bolts and bolt heads. An adjusting bolt 49, having a smooth surface, is passed through the arm 45 and a short eccentrically disposed stub, 50 on its end is adapted when rotated, to adjust the relative position of the plate with respect to its opposing plate 27 when the clamping bolts 47 have been loosened. This plate 46 is of substantially the same shape as its opposing plate 27, but is slightly shorter than the same so that its righthand end edge terminates a slight distance back of the adjacent edge of plate 27, in order to provide a shoulder 51, the purpose of which will hereinafter more fully appear, and suitable pockets 52 are provided in plate 46 into which the teeth 41 of blade 34 are adapted to enter when the upper plate is moved toward the lower stationary plate to form a clamp for the end of a strip of film that has been impaled upon the teeth 41.

The opposite end portion of the arm 45 extends rearward of the fulcrum or sleeve 43, approximately the same distance as the front portion extends forward of said sleeve and has its end connected by a link 53 to the upper arm 54 of a vertically disposed actuating lever 55. This lever and arm are somewhat of the bell-crank type and are fulcrumed at the apex of the bell-crank (which is adjacent its upper end) upon a laterally disposed pivot 56 extended through the standard 20 and projected horizontally upon opposite sides thereof, as shown in Fig. 1 of the drawings. At the bottom of the lever 55 is a laterally projecting foot rest, 57, upon which the foot of the operator is placed to actuate said lever and move its lower end rearward in order to lower the front end of arm 45 and bring the plate 46 carried thereby into contact with the opposing stationary plate 27 and clamp the end of the film.

In order to permit the lever to be held in this rearward position, I have provided a suitable pawl 58 that is fulcrumed intermediate its ends upon a pivotal pin 59, projecting laterally from the side of the foot, 57. A spring 60 normally keeps the forward portion of the pawl depressed and permits its lower end to ride over suitable stop lugs 61 and 62, arising from the base 22, while the opposite or rear portion of said pawl is provided with an upturned extension 63, that has its end terminate above the plane of the upper surface of the foot plate

so that it may be engaged by the toe of the operator's foot and depressed to release the pawl from the stop-lug. The purpose of providing two stop-lugs is to permit the second lug 62, or one nearest the standard, to be engaged by the pawl in the event said foot plate 57 is not moved far enough to the rear or should accidentally slip off the rearmost lug 61, as illustrated in Fig. 6 of the drawings.

Abutting the bearing boss 24 and mounted upon the end of the arbor 25 opposite sleeve 43, is another sleeve 64 that is constructed similarly to sleeve 43, with the exception that its exterior diameter is considerably reduced, as shown in Fig. 7 of the drawings. This sleeve is preferably secured upon arbor 25 by a suitable washer and bolt 65, and surrounding the sleeve upon its reduced portion is a suitable exterior barrel 66, that is provided with a lateral extension or arm 67. The outer portion of the arm 67 has a flat upper surface. Secured upon this flat surface of arm 67 is a substantially rectangular shaped plate 68, that is so positioned thereon that the left-hand end edge thereof abuts flush against the adjacent end edge of the stationary plate 27, so that the upper surfaces of said plates will be in the same horizontal plane when arm 67 is in its lowered position. This plate is adjustably secured in position in substantially the same manner as plates 27 and 46 by suitable clamping bolts 69, 69, the shanks and heads whereof are disposed in widened or enlarged openings 70, 70, in the arm 67, and have their threaded ends tapped into threaded openings in the plate. A smooth barrel bolt 71, provided with an eccentric stud, 72, upon its end, that enters a recess in the bottom of plate 68, is adapted to adjust said plate horizontally upon its support toward or away from the plate 27, the edge of which it is adapted to engage. The disposition of the plates 27 and 68 is such that, when the end of a film strip is clamped upon the plate 27 by its companion clamping member 46, the projecting end of said film will extend into the path of movement of the adjacent end edge of plate 68 across the shelf 51 and when the latter plate (68) is brought down, the lower corner edge thereof nearest plate 26 will engage the upper adjacent corner edge of said plate 26 and shear off the projecting portion of the film, leaving a smooth, straight edge at a right-angle to the longitudinal edge of the film.

Formed integrally with the sleeve 64 is an arm 73, that extends both forward and rearward of the sleeve, the forward end portion being flattened and spread out to provide a support or base 74, upon which a flat rectangular shaped plate 75 is adapted to be mounted in opposition to plate 68. I prefer to mount this plate 75 adjustably upon its support, in substantially the same manner as the clamping plates heretofore described are mounted, by providing a bolt 76 that extends through a widened or enlarged opening 77 in said support, and has its threaded portion tapped into the plate 75. A bolt 78, having a smooth shank, is disposed transversely through this support 74 and is provided at its lower end with an eccentrically projecting stud 79, that projects into and is seated in a proper recess formed in the adjacent portion of plate 75. By releasing bolt 76 the bolt 78 may be rotated to adjust the plate to a proper position. A suitable recess 80 is made in the under surface of the support 74 and a small plunger 81 is mounted therein and passes through the plate 75. This plunger is kept normally in an extended position by a coiled expansion spring 82 surrounding the same, so that when the outer end of arm 73 is lowered so that the plate carried thereon will come adjacent to plate 68, the plunger 81 will engage the film disposed therebetween.

Plate 75 is extended slightly beyond the left-hand end edge of its companion plate 68, so that its said left-hand edge will be adapted to lie flush against and abut the adjacent end edge of plate 46 and will overlap the shoulder 51 formed on the plate 27 heretofore described. The plates 68 and 75 comprise the clamping jaws for the opposite end of a strip of film to be spliced to the end of the film retained between the clamping plates 46 and 27. When the strip of film has been properly positioned between plates 68 and 75 and lowered, the lower left-hand corner of plate 75 will engage the upper right-hand corner of plate 46 so as to shear the film squarely across at substantially a right-angle to the longitudinal edge or margin of the film strip.

The rear portion of arm 73 extends beyond its fulcrum and is connected at its end by a link 84 to the upper arm 85 of a suitable actuating lever 86. The pivotal boss of this lever 86 is mounted upon the adjacent extended end of the shaft 56 heretofore described and its lower end terminates in a suitable foot 87. The construction of lever 86 and its foot 87 is similar in all respects to the lever and foot 55 and 57 and is provided with the pawl 88, having an upturned inner end 89 adapted to be engaged by the toe of the operator's foot, and its lower end is adapted to engage either of the stops 61 or 62 when the lever is moved rearward in the same manner as its companion lever.

In order that the levers 55 and 86 may be assisted in retaining their adjusted positions and in order to facilitate their operation, I have mounted upon the standard 20

suitable pendent bolts 90, that are pivoted at their upper ends to said standard and the lower ends of these bolts are passed through suitable bosses 91 projecting laterally from their respective levers. A coiled expansion spring 92 surrounds the bolts 90 between their pivotal ends and the lugs 91 so that when the lever is moved rearward or forward until the boss 91 passes the dead center, or, in other words, out of alinement with a plane passing through the pivotal member and the fulcrum 56, the spring will exert its pressure to force the lever to the rear or forward to the limit of its respective movements.

It is essential in the operation of this device that the plates 27 and 68 be brought into horizontal alinement with each other as the first step in the operation of the apparatus, so that the perforations in the right-hand end of the film strip may be impaled upon the teeth 41 projecting above plate 27, substantially in the manner shown in Fig. 8. In this position the plate 46 is elevated by moving foot treadle 57 to the rear. Plate 75 is also elevated and the next step of the operation is to lower plate 75 into contact with plate 68, as shown in Fig. 9 of the drawings. This is done by releasing foot treadle 87 and permitting it to return to normal position. The two plates 75 and 68 are now raised while in contact with each other by locking the arm 73 to the arm 67. This is accomplished by providing a suitable pivoted locking lever 93 that is fulcrumed adjacent its lower end to a pivotal stud 94 projecting laterally from the arm 67. This lever 93 is provided with two recesses or notches 95 and 96, the former being disposed above the fulcrum and the latter below the fulcrum, and are adapted to engage projections 97 and 98 extending laterally from their respective arms 73 and 67. When the lever 93 is disposed in the position shown in Fig. 3 of the drawings, the lower projection 98 is engaged by its respective recess and the two plates will be raised together. However, when the lever is moved into the opposite position so that the projection 97 is engaged by its respective recess, the lowest projection is released and the arm 73 may be raised by itself.

After the right-hand strip of film has been clamped between the plates 75 and 68, and the same raised to the position shown in Fig. 10 of the drawings, the left-hand strip of film is impaled upon the teeth 41 on plate 27, as shown in this figure, and then the companion plate 46 is brought down into contact with plate 27 so as to clamp the film between the same. This position of the respective parts is shown diagrammatically in Fig. 11 of the drawings. The left-hand clamping jaws are held stationary, as shown in Fig. 11, and the right-hand jaws are brought down into engagement therewith, as shown in Fig. 12. The shearing of the respective ends of the film takes place upon the engagement of the right-hand jaws with the left-hand jaws and the projecting ends of the film are brought into close contact with each other. This is shown in Fig. 12 of the drawings and greatly enlarged in Fig. 13.

After the ends of the film have been sheared in the manner just described, the right-hand clamping members are again elevated and the portions of the film which are exposed on the plates are scraped by means of a suitable scraping tool, the details of which are set forth in an application for United States Letters Patent for a "Scraper for film splicing machines" executed by me even date herewith and filed even date herewith, Serial No. 133,771. This scraping operation bevels the end edges of the film strip so that when the cement has been applied thereto and the ends of the film returned into contact with each other, the splice will be made flat and accurate.

From the above it will be noted that in making the splice the operator may readily select the point at which the splice is made, by impaling the ends of the film upon the teeth 41 so as to form the splice in the space on the film between the pictures, so that after the film has been spliced, the pictures will run in proper sequence and the proper number of perforations would be disposed upon the marginal edge of the picture upon both sides of this splice, thereby avoiding the "jump" of the picture when projected, which necessitates the reframing of the projecting machine.

What I claim is:—

1. A film splicing machine comprising two pairs of film clamping jaws, and a common film registering device carried by one of said jaws and adapted to locate both ends of the film with respect to each of said pairs of jaws.

2. A film splicing machine comprising two pairs of film clamping jaws, and a film registering device carried by one of said jaws and adapted to locate both ends of the film with respect to each of said pairs of jaws the adjacent ends of said clamping jaws being so related as to shear the film held by said respective jaws.

3. A film splicing machine comprising two pairs of film clamping jaws, each pair of jaws adapted to receive an end of the film to be spliced, the adjacent ends of said jaws being so related as to shear the film held by said respective pairs of jaws.

4. A film splicing machine comprising two pairs of film clamping jaws, each pair of jaws adapted to receive an end of the film to be spliced, the adjacent ends of said jaws being so related as to shear the film

held by said respective pairs of jaws, and means whereby one pair of jaws is movable independently of the opposite pair.

5. A film splicing machine comprising two pairs of clamping members each comprising suitable supports, oppositely disposed plates mounted thereon, and means for adjusting said plates with respect to each other.

6. A film splicing machine comprising a pair of clamping jaws adapted to retain one end of a strip of film to be spliced, a second pair of clamping jaws adapted to retain the end of the other strip of film to be spliced, means for moving said second pair of jaws independently of the first pair, and a registering device common to both pairs of jaws whereby the ends of the strips of film are adapted to be registered.

7. A film splicing machine comprising a pair of clamping jaws adapted to retain one end of a strip of film to be spliced, a second pair of clamping jaws adapted to retain the end of the other strip of film to be spliced, means for moving said second pair of jaws independently of the first pair, and locking devices carried by said second pair of jaws whereby the respective jaws are capable of movement both simultaneously and independently of each other.

8. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, a coacting jaw movable with relation thereto, said jaws adapted to clamp one end of the film to be spliced, and a second pair of clamping jaws capable of movement independently of each other and between which the opposite end of the film to be spliced is clamped, said second pair of jaws being movable independently of said first pair of jaws whereby the ends of the film held by the respective pairs of jaws are adapted to be sheared.

9. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, a coacting jaw movable with relation thereto, a second pair of clamping jaws movable independently of said first pair and constituting with said first pair of jaws independent shearing members for the ends of the respective film, said second pair of jaws being capable of movement independently of each other, and a film registering device carried by one of said jaws and adapted to locate film with respect to each of said pairs of jaws.

10. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, an arbor on said support, a reciprocable arm fulcrumed on said arbor, a coacting jaw carried on one end of said arm, an actuating lever operatively connected to said arm, a second arm fulcrumed on said lever, a clamping jaw carried on said second arm, a clamping jaw coacting with said last mentioned jaw, and an actuating lever operatively connected to said last mentioned arm.

11. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, an arbor on said support, a reciprocable arm fulcrumed on said arbor, a coacting jaw carried on one end of said arm, an actuating lever operatively connected to said arm, a second arm fulcrumed on said lever, a clamping jaw carried on said second arm, a clamping jaw coacting with said last mentioned jaw, and means adapted to lock said last mentioned pair of jaws whereby the same are capable of both simultaneous and independent movement with respect to each other.

12. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, an arbor on said support, a reciprocable arm fulcrumed on said arbor, a coacting jaw carried on one end of said arm, an actuating lever operatively connected to said arm, a second arm fulcrumed on said lever, a clamping jaw carried on said second arm, a clamping jaw coacting with said last mentioned jaw, and a film registering device carried by one of said before-mentioned jaws and adapted to locate film with respect to each of said pairs of jaws.

13. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, an arbor on said support, a reciprocable arm fulcrumed on said arbor, a coacting jaw carried on one end of said arm, an actuating lever operatively connected to said arm, a second arm fulcrumed on said lever, a clamping jaw carried on said second arm, a clamping jaw coacting with said last mentioned jaw, means adapted to lock said last mentioned pair of jaws whereby the same are capable of both simultaneous and independent movement with respect to each other, and a film registering device carried by one of said before mentioned jaws and adapted to locate film with respect to each of said pairs of jaws.

14. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, a coacting jaw movable with relation thereto, a second pair of clamping jaws movable independently of said first pair and capable of movement independently of each other, and separate devices adapted to adjust the respective jaws with respect to each other.

15. A film splicing machine comprising a suitable support, a jaw mounted thereon and stationary therewith, an arbor on said support, a reciprocable arm fulcrumed on said arbor, a coacting jaw carried on one end of said arm, an actuating lever operatively connected to said arm, a second arm fulcrumed on said lever, a clamping jaw carried on said second arm, a clamping jaw coacting with

said last mentioned jaw, an actuating lever operatively connected to said last mentioned arm, and separate devices carried by each arm whereby each jaw is adapted to be adjusted thereon and with respect to the other jaw.

16. A film splicing machine comprising a pair of clamping jaws adapted to retain one end of a strip of film, a second pair of independently moving jaws coacting therewith, a locking device adapted to lock said second pair of jaws together and retain a strip of film between the same whereby said second film strip is adapted to be moved bodily with respect to said first film strip, and means for moving the said second pair of jaws independently of said first pair of jaws whereby the ends of the film retained by said pairs of jaws are sheared.

17. In a film splicing machine two jaws each provided with means for holding a piece of film, one of said jaws having movement relative to the other of said jaws whereby the ends of the pieces of film carried by the respective jaws are sheared.

18. In a film splicing machine two jaws each provided with means for holding a piece of film, one of said jaws having movement relative to the other of said jaws whereby the pieces of film carried by the respective jaws are sheared and brought together in overlapping relation to each other.

19. In a film splicing machine two jaws each provided with means for holding a piece of film, one of said jaws having movement relative to the other of said jaws whereby the ends of the pieces of film carried by the respective jaws are sheared simultaneously by the coaction of said jaws.

20. In a film splicing machine two jaws each provided with means for holding a piece of film, one of said jaws having movement relative to the other of said jaws whereby the pieces of film carried by the respective jaws are sheared and brought together in alinement with their sheared ends in overlapping relation to each other in position for splicing.

Signed at Chicago, county of Cook and State of Illinois, this 16th day of November, 1916.

ALBERT S. HOWELL.

Witnesses:
E. K. LUNDY, Jr.,
H. SLACK.