

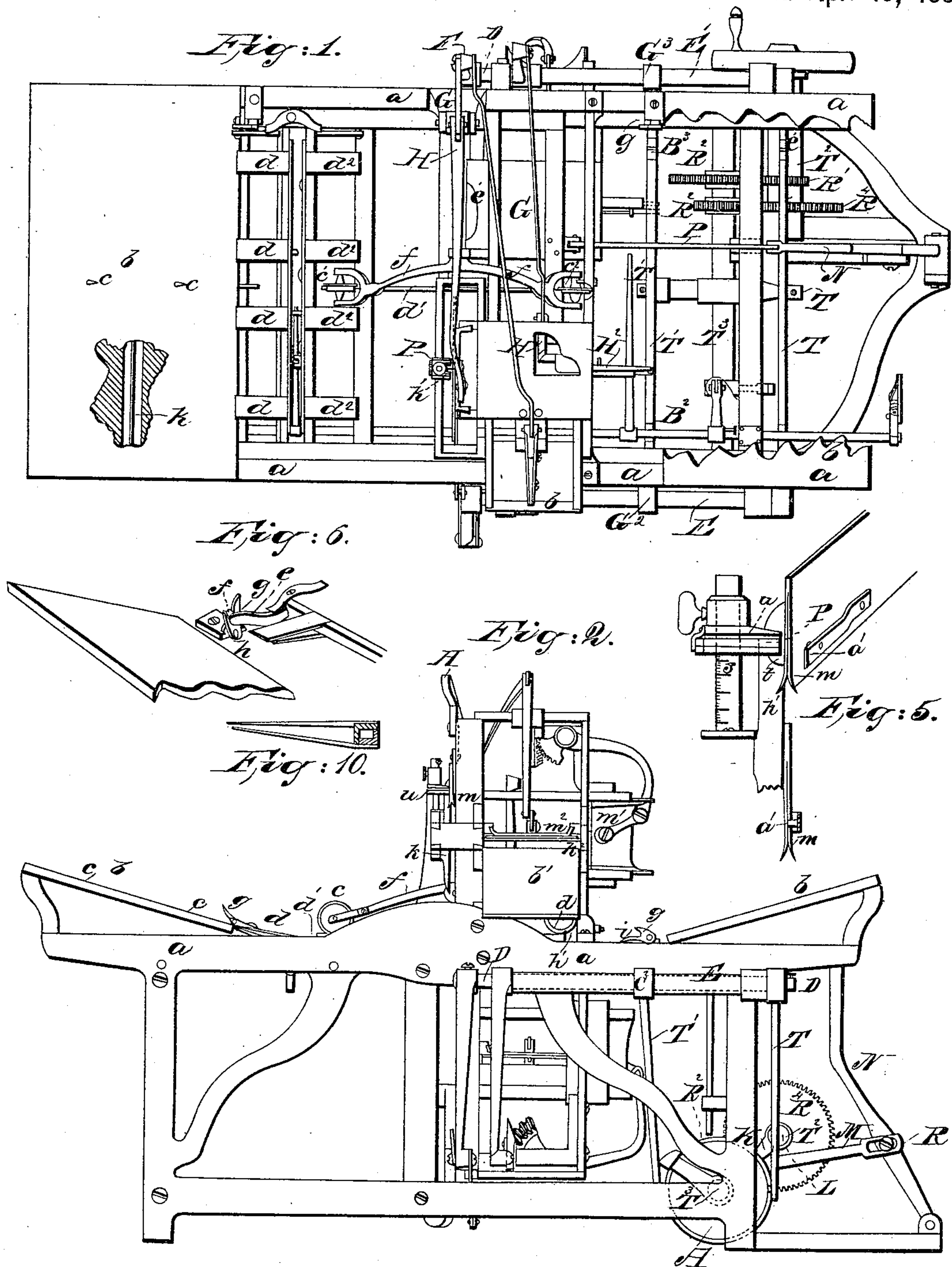
J. NORTH.

2 Sheets—Sheet 1.

Machine for Folding Paper.

No. 14,697.

Patented Apr. 15, 1856.



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Fig: 8.

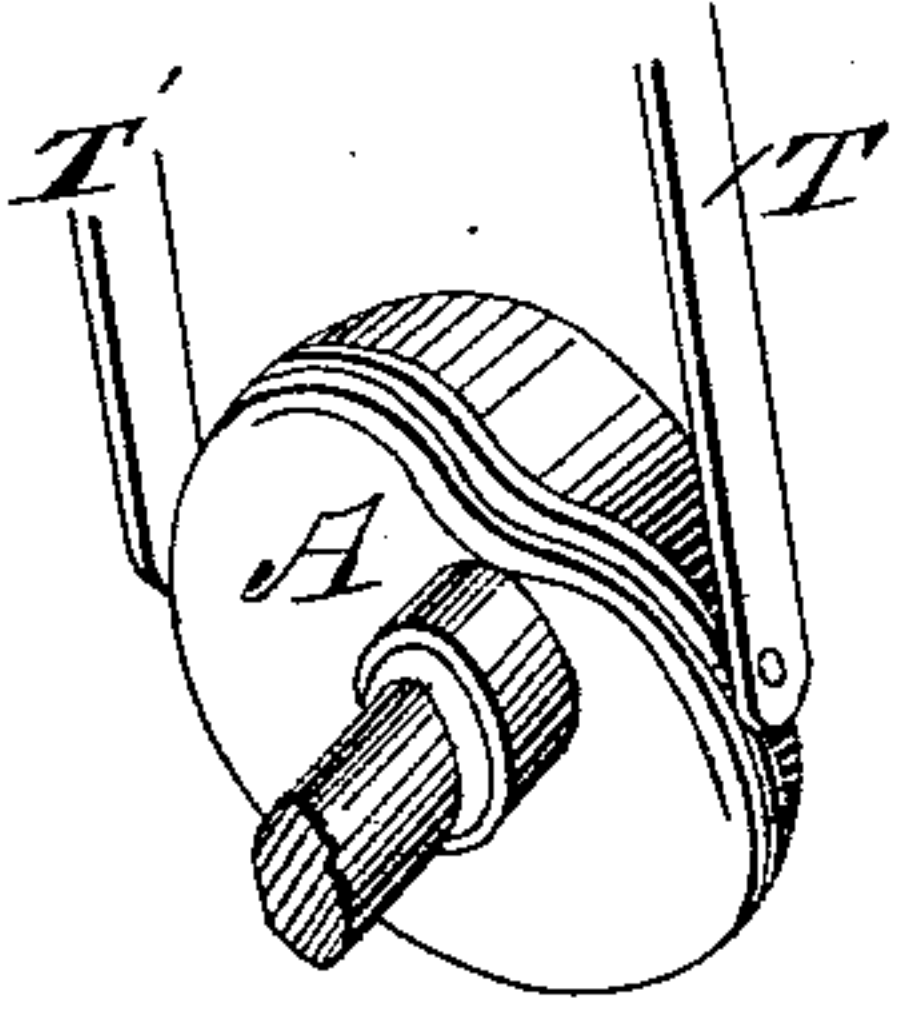


Fig: 4.

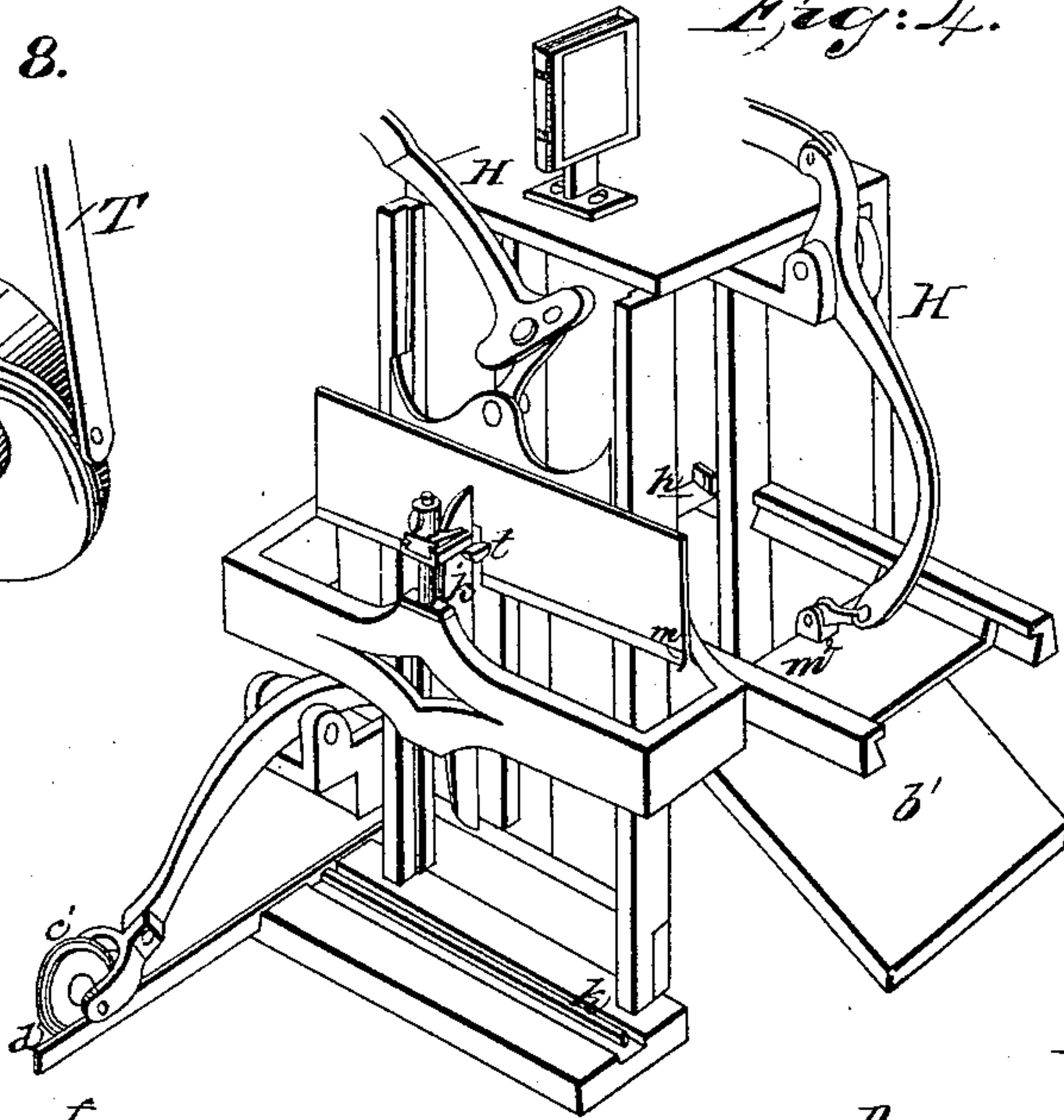


Fig: 7.

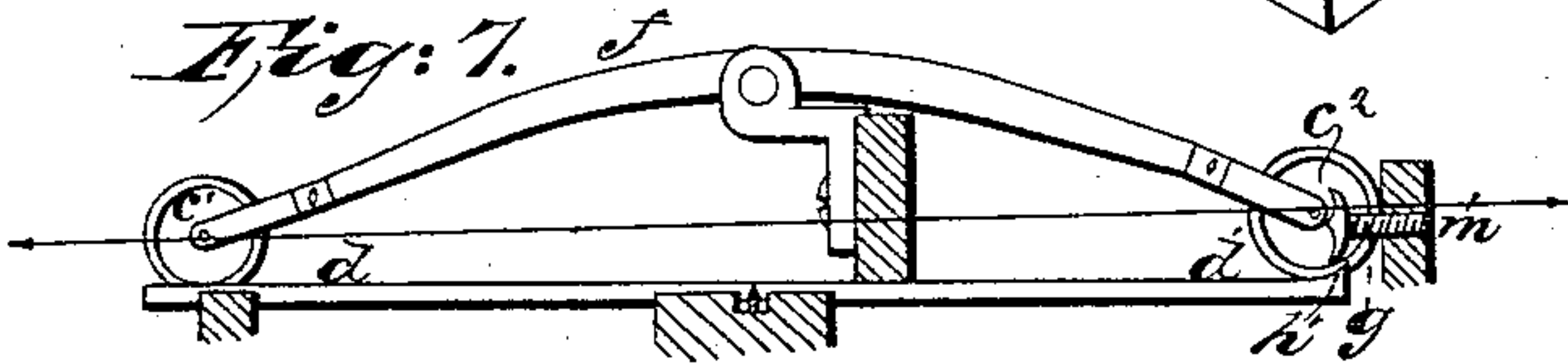


Fig: 9.

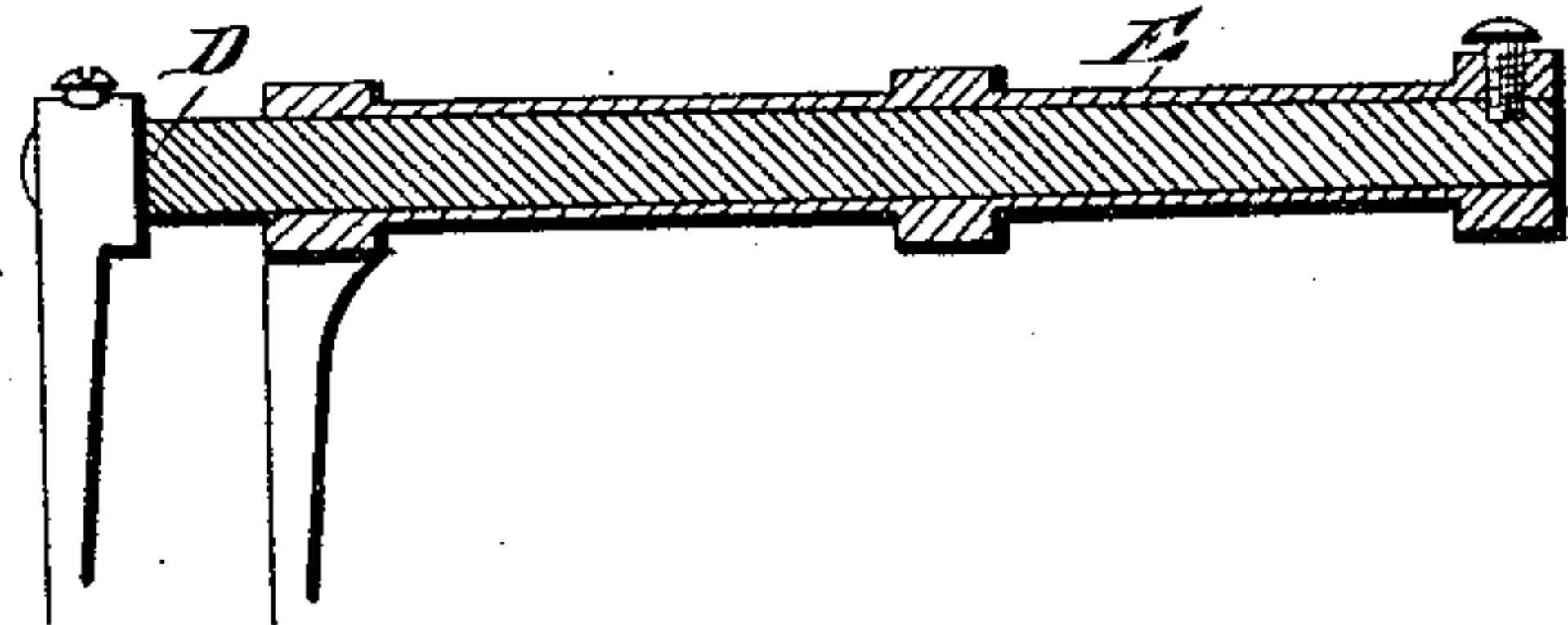
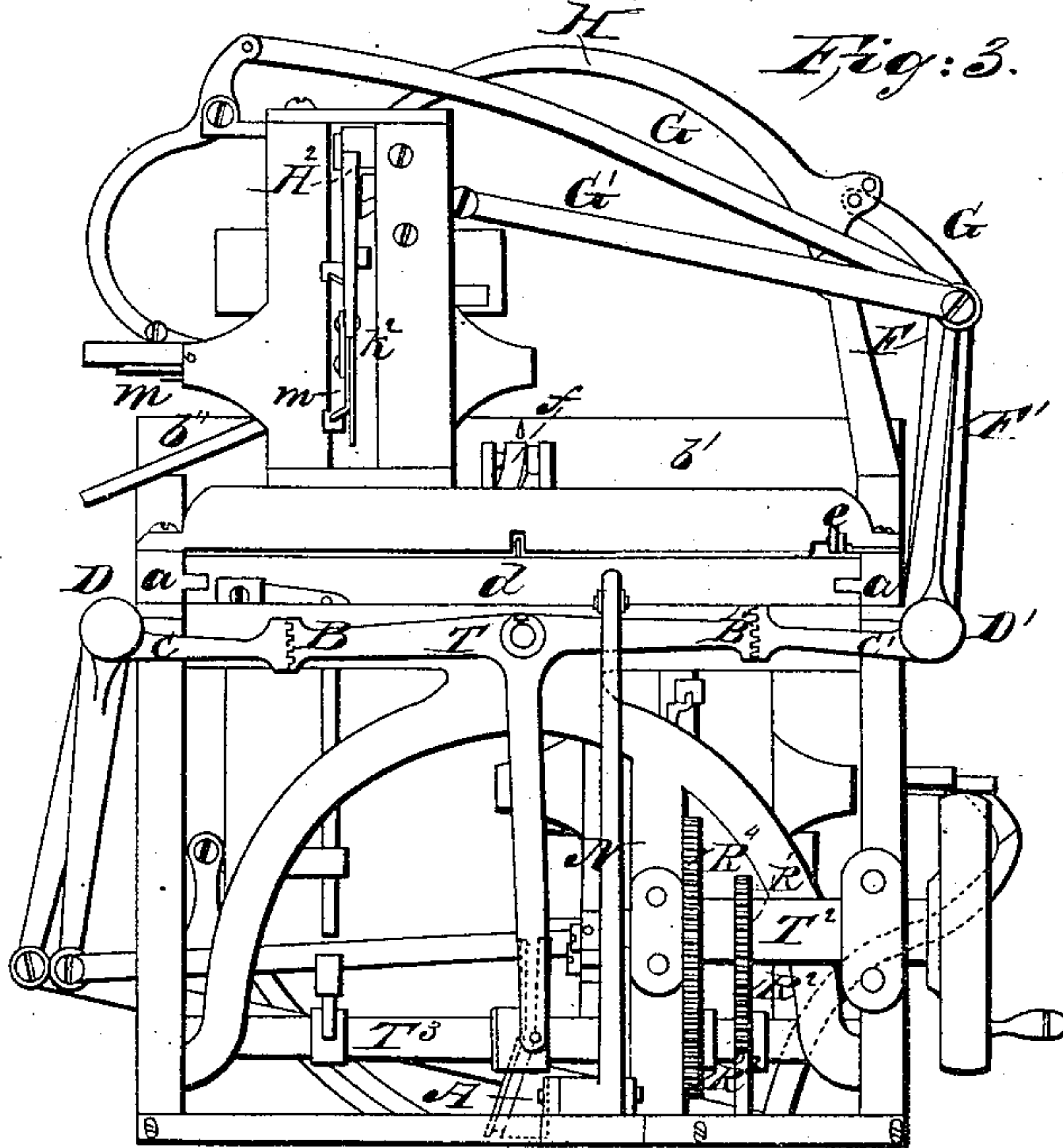


Fig: 3.



UNITED STATES PATENT OFFICE.

JOHN NORTH, OF MIDDLETOWN, CONNECTICUT.

MACHINE FOR FOLDING PAPER.

Specification forming part of Letters Patent No. 14,697, dated April 15, 1856.

To all whom it may concern:

Be it known that I, JOHN NORTH, of Middletown, in the county of Middlesex and State of Connecticut, have invented certain Improvements in Machines for Folding Paper, and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the usual manner of making, modifying, and using the same, reference being had to the accompanying drawings, of which—

Figure 1 is a plan of the machine. Fig. 2 is a side elevation. Fig. 3 is an end view. Fig. 4 is a detached view showing in perspective the nipper and folding-knife and parts connected therewith. Fig. 5 is an enlarged view showing the mode of checking and adjusting the motion of folding-nipper. Fig. 6 is a detached view of the trip-dog and part of a finger-bar. Fig. 7 is a detached view of the cutting apparatus. Fig. 8 is a detached view of the cam which gives the motion to the nippers. Fig. 9 is a section of one pair of the concentric rock-shaft. Fig. 10 is a section of the fingers and finger-bar.

My invention consists of certain improvements in machines for folding paper, hereinafter described, whereby I am enabled to fold accurately and with great neatness, economy, and rapidity.

In paper-folding machines hitherto essayed it has been found impracticable to fold accurately—that is, to fold every sheet alike—and this defect has entirely prevented the use of such machines to any profitable account. According to the mode set forth in the patent granted to Ed. M. Smith, November 27, 1849, the folding was effected by means of a moving straight-edge or knife pressing the paper between a pair of rollers, and in practice it is found from slight differences of friction on different parts of the sheet from resistance of the air and various slight disturbing causes that the fold cannot always be accurately made upon such principle of operation.

According to the mode of operation set forth in the patent granted to I. K. Snow, October 15, 1850, the folding was effected upon a principle of operation similar to the last mentioned, though differing somewhat in detail. The use, however, of a moving knife or

straight-edge to lift or push the paper between gripping, pressing, folding, or carrying surfaces must be attended with inaccuracy in the folding for reasons already stated. Another objection to the above modes, and a fatal one for the operation of book-folding, is the soiling of the paper. The carrying or folding surfaces become in time covered with ink and soil the sheet more or less every time in passing.

The object of my invention is to remedy these defects and otherwise to improve the operation of book-folding. Instead of a moving knife or straight-edge, I use a stationary knife, by which the folding is in part effected. Instead of moving the sheet from the table in the act of folding, the sheet remains upon the table while the fold is made. Instead of pushing or carrying the folded sheet between plates or rollers, I carry it by means of nippers which seize the sheet by the middle of the middle margin, as hereinafter set forth.

The frame-work of my machine, as seen at *a a* in Figs 1 and 2, is somewhat similar in appearance to the frame-work of a double printing-press.

As the machine is double in its operation, it will be necessary only to describe one half, similar letters referring to similar parts in the two halves.

b is the table or fly-board, upon which the sheets are laid in order to be introduced to the folding apparatus. This board has register-pins *c c*, which are operated in the usual manner adopted in printing-presses. The sheet is seized on its edge by the fingers *d d*, attached to the reciprocating carriage, and withdrawn from the fly-board and carried by the fingers under the folding-nippers. The fingers *d d* are made to open and close at the proper times by mechanism commonly employed in printing-presses to effect the same operation, which need not be described. The fingers are raised and dropped at the time of seizing the sheet by a peculiar contrivance described as follows: Attached to the finger-bar, Fig. 6, near its end, is a projecting piece *e*, having near its end a wrist-pin or bolt *f*. On the frame, near the edge of the fly-board, is a trip-dog *g*, turning upon a pivot *h*. This dog is provided with a slot *i*, into which the wrist-pin enters as the carriage advances, and

from the rotation of the dog on its pivot it will be seen that the fingers must rise up until the dog is vertical and then descend as the dog moves on. When the finger-bar moves away from the fly-board, the wrist-pin carries the dog back to its place for the reception of the pin on its return. Attached to and near the end of the carriage is the folding edge or knife k , as seen in Fig. 1, under the folding-board, part of which is represented as broken out to show the knife. The knife is fixed to the frame, the edge rising slightly above its level. The folding-nipper m , Figs. 2, 4, and 5, has a pair of grasping edges or jaws, which jaws may be opened and closed in various ways, the mode represented being merely to open the jaws by pressing over the folding edge or knife and keeping them closed by the spring of the metal of which they are made. The edge of the knife is slightly raised above the level of the frame on which the paper is carried, so that the paper rests at that part on the edge of the knife. When by the movement of the carriage the knife is brought immediately under the folding-nipper m , the carriage stops and the middle margin of the sheet is over the edge of the knife. By mechanism shortly to be described the nipper is brought down upon the knife, the jaws of the nipper pressing the paper over its edge and making the fold. When the nipper moves away from the knife, it carries the folded sheet with it into a position to be folded a second time by the knife k' and nipper m' . In order to keep the nipper from rising beyond the required position and to determine or gage this position, I use a check-piece p , which is adjustable on the graduated stem s and a stop-piece t on the nipper m . The check-pin slides toward and from the nipper, being grooved or dovetailed into the piece u , which is fixed to the stem s . The spring w keeps the check-piece against the nipper m . The nipper m' is moved by mechanism, shortly to be described, and as it comes up to the sheet, which is held in place by the nipper m , it folds it over the knife k' . At the time the nipper m' comes up to make the fold it opens the nipper m in the following manner: A projecting piece x on this nipper strikes the pin a' , which is attached to one jaw of nipper m , and passes through an opening in the other jaw, so as to open the jaws and relieve the sheet from the grasp of nipper m . The nipper m is cut out in the center of the folding edges to the extent of the width of the bite or grasp of the nipper upon the sheet, so as to allow the second nipper m' to act upon the whole extent of the sheet. While in the act of folding the nipper m' pushes the check-piece p from above the stop t and allows the nipper m to be carried up till the stop t strikes the fixed piece u , and the nipper m is entirely clear from the sheet. The check-piece bears against the stop-piece until the nipper m is carried down again to make another fold. The nipper m' having completed the second fold, car-

ries the sheet back, to be subjected to a third folding by nipper m^2 and knife k^2 . The operating, checking, and opening the nipper m' and of clearing it from the sheet are performed in a manner similar to those just described for nipper m , and so on for nipper m^2 and any number that may be requisite.

When the sheet is folded, it is dropped from the last nipper upon the delivery-table b' . The drawings represent a machine for folding octavo volumes.

According to the mode of printing, the halves of the sheet must be folded in opposite directions, and the machine is so arranged that one half is folded up and the other half down, the part for folding from below being similar in construction and operation to that already described. The sheet is laid on the fly-board, and as it is taken along by the fingers upon the carriage it is cut in halves by the rolling cutter c' upon the straight-edge or bed d' , and while one half is carried through and folded, as already described, the other goes through a similar course, except that it passes under a knife attached to the fixed block e' and is folded by a nipper which rises up from below.

In the machine represented there are two fly-boards and there are two sets of fingers d d^2 upon the reciprocating carriage, and also upon that side of the carriage where the paper is first carried over the knife I have two knives attached to the carriage, these knives k k' coming alternately under the nipper m . A single knife might be placed under the carriage and raised up and carried down at proper times, but the machinery required to effect this would be far more expensive than the two knives moving with the carriage, and otherwise objectionable. When the sheet passes under the knife, one knife fixed to the frame-work of the machine will answer.

To cut the sheets on both sides of the machine, I have two rolling cutters c c^2 at the extremities of a rocking bar f , which is pivoted to the frame. One end of this bar is in contact with a bifurcated spring-catch or kind of escapement g , and slips over (above and below) a projection in the center of this catch, as it is shown in Fig. 7, by the following means: The extremities of the bed on which the cut is made are provided with inclined planes, one of which is shown at h' , Fig. 7, the other being at the opposite part of the carriage. As the cutting-rollers ascend these inclined planes, they are alternately raised and depressed and the end of the rocking bar is forced to pass over the projection of the escapement, so that it is above the projection when that end of the bar is up and below when it is down. The spiral spring n' holds the bar in either of its positions with sufficient force to keep the cutters to their work.

The various motions given to all the folding-nippers are derived from a single cam A , operating upon the lower ends of the two T-

levers T T'. The arms of lever T are furnished with sector-gears B B', which take into arms G G', connected with the rock-shafts D D'. These rock-shafts are inclosed in and pass through hollow rock-shafts E E', with which they are concentric. The arms of the lever T' are also furnished with sector-gears B² B³, similar to gears B B', and these take into arms G² G³, connected with the hollow rock-shafts E E'. The first folding-nipper *m* gets its motion from rock-shaft D', through the medium of the vibrating arm F, connecting-link G, and lever H, to which this nipper is attached. The second folding-nipper *m'* gets its motion from the hollow rock-shaft E', through the medium of the vibrating arm F', connecting-link G', sector bevel-gear H', and lever H². The third nipper *m²* gets its motion from the rock-shaft D', through the medium of arm F, connecting-link G², and lever H³. The nippers below the carriage get their motion from rock-shafts E D by means similar to those just described for nippers *m m' m²*. The carriage is moved back and forth by the crank K upon the main driving-shaft L, which shaft is inclosed within the hollow shaft T², through the medium of the connecting-rod M, lever N, and connecting-link P. As the carriage must be stopped while the sheet is being folded upon it, the stop is caused by the slot R in the connecting-rod M, in which plays the pin connecting the rod with the lever, so that the crank moves through nearly a quarter-revolution while the slot is passing over the pin and before it acts upon the lever N. The cam A makes two revolutions to one of the

crank K, and this is effected as follows: The small gear R' on the driving-shaft T² takes into the larger gear R² on the cam-shaft T³, and the small gear R³ on the cam-shaft takes into the larger gear R⁴ on the hollow shaft T², inclosing the driving-shaft L. The crank is connected with this hollow shaft, and by the suitable proportionment of the gearing the requisite relative motions are given to cam and rock shafts.

What I claim as my invention is—

1. Folding the paper by means of a stationary straight-edge or knife and folding-nippers, substantially as herein set forth.
2. The manner of relieving the sheet from the nipper, as set forth.
3. The adjustable cheek and the mode of releasing its hold by the advance of the nippers, as set forth.
4. The rotating trip-dog for raising and depressing the fingers, as set forth.
5. Attaching the knives to the reciprocating carriage, as set forth.
6. Operating the reciprocating carriage by means of the crank K, the slotted connecting-rod M, the lever N, and the link P, whereby I attain accuracy and ease of movement.
7. The cutting-rollers hung on a bar vibrated and checked, as herein set forth.
8. The arrangement of the T-levers with the double concentric rock-shafts for operating the nippers by one cam, as herein set forth.

JOHN NORTH.

Witnesses:

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CHAS. G. PAGE.