B. GUSTAFSON.

SHEET FEEDING MECHANISM.

APPLICATION FILED JUNE 2, 1908.

934,608.

Patented Sept. 21, 1909.

3 SHEETS—SHEET 1.

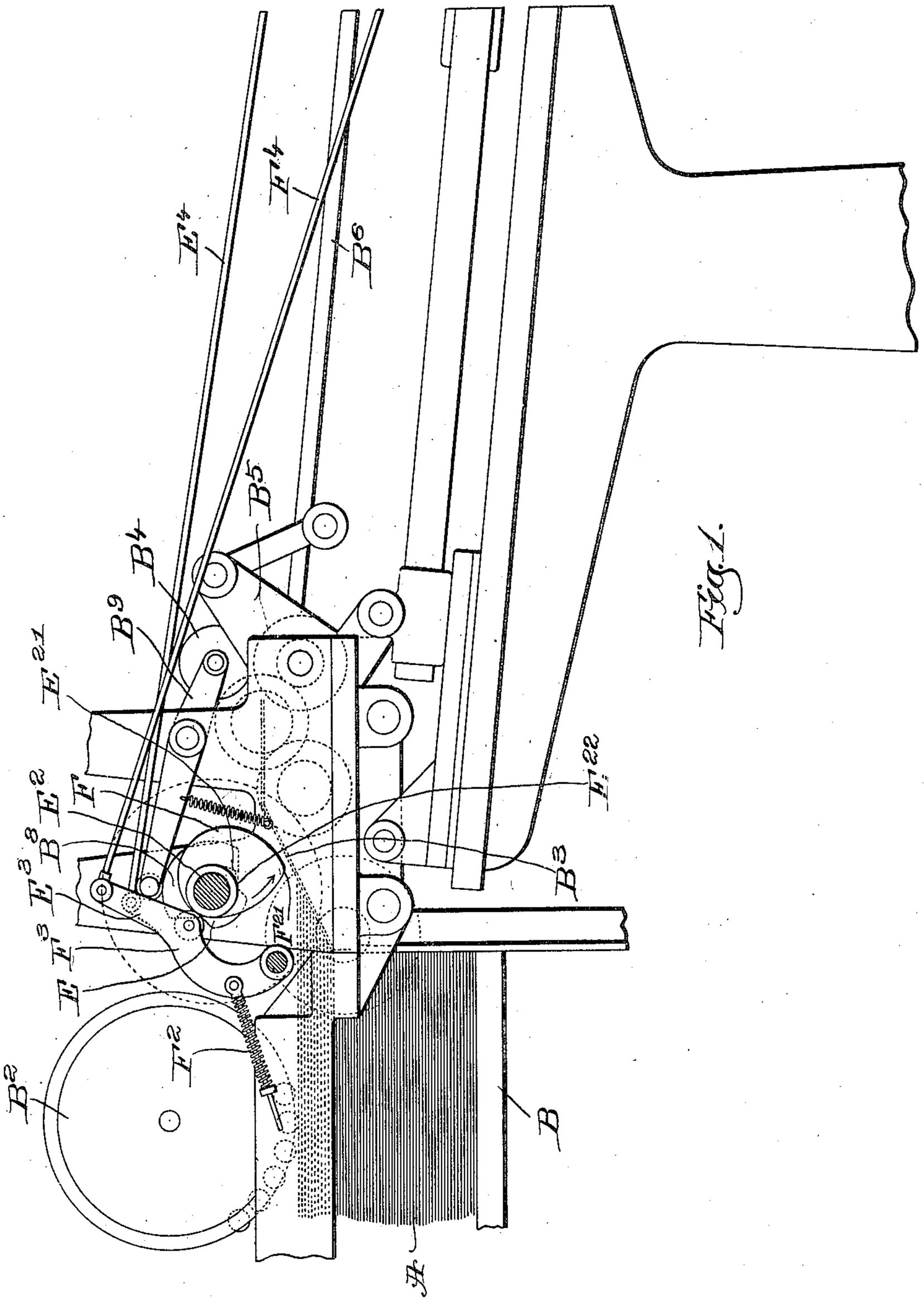


Fig. 1.

Witnesses.
Thomas J. Drummond.
Joseph M. Ward.

Inventor.
Bernhard Gustafson,
by Crosby & Gregory attys.

B. GUSTAFSON.

SHEET FEEDING MECHANISM.

APPLICATION FILED JUNE 2, 1908.

**934,608.**

**Patented Sept. 21, 1909.**

3 SHEETS—SHEET 2.

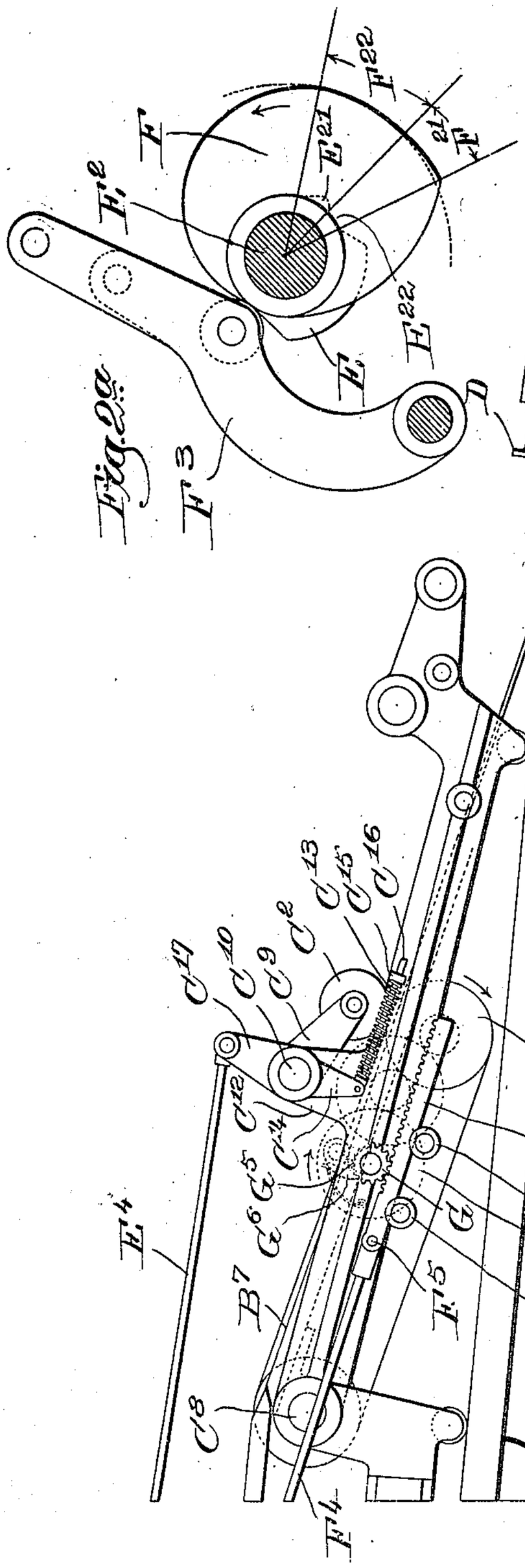


Fig. 2a.

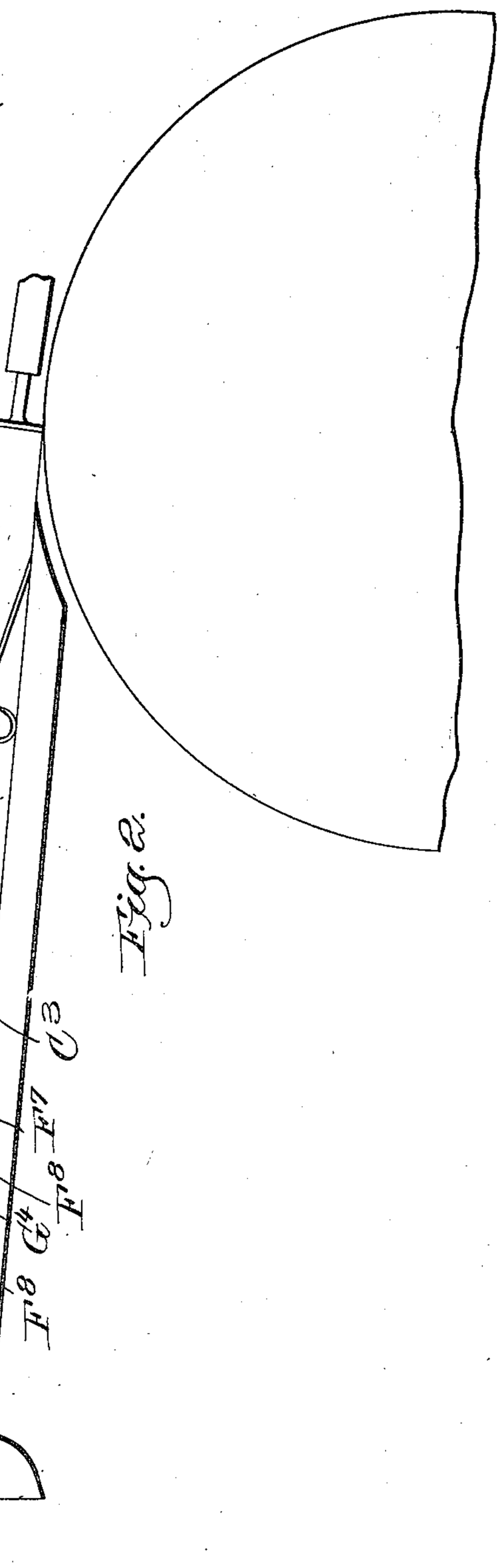

Fig. 2.

Witnesses:
Thomas J. Drummond.
Joseph M. Ward.

Inventor.
Bernhard Gustafson,
By Crosby & Gregory attys.

B. GUSTAFSON.

SHEET FEEDING MECHANISM.

APPLICATION FILED JUNE 2, 1908.

934,608.

Patented Sept. 21, 1909.

3 SHEETS—SHEET 3.

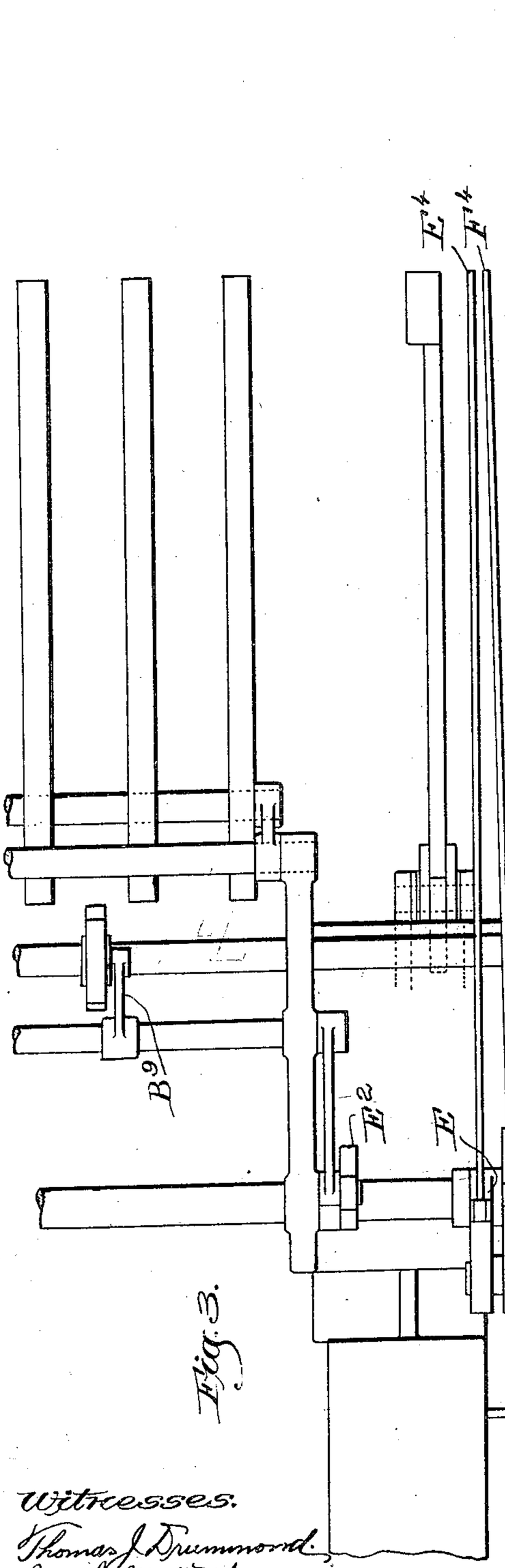

Fig. 3.

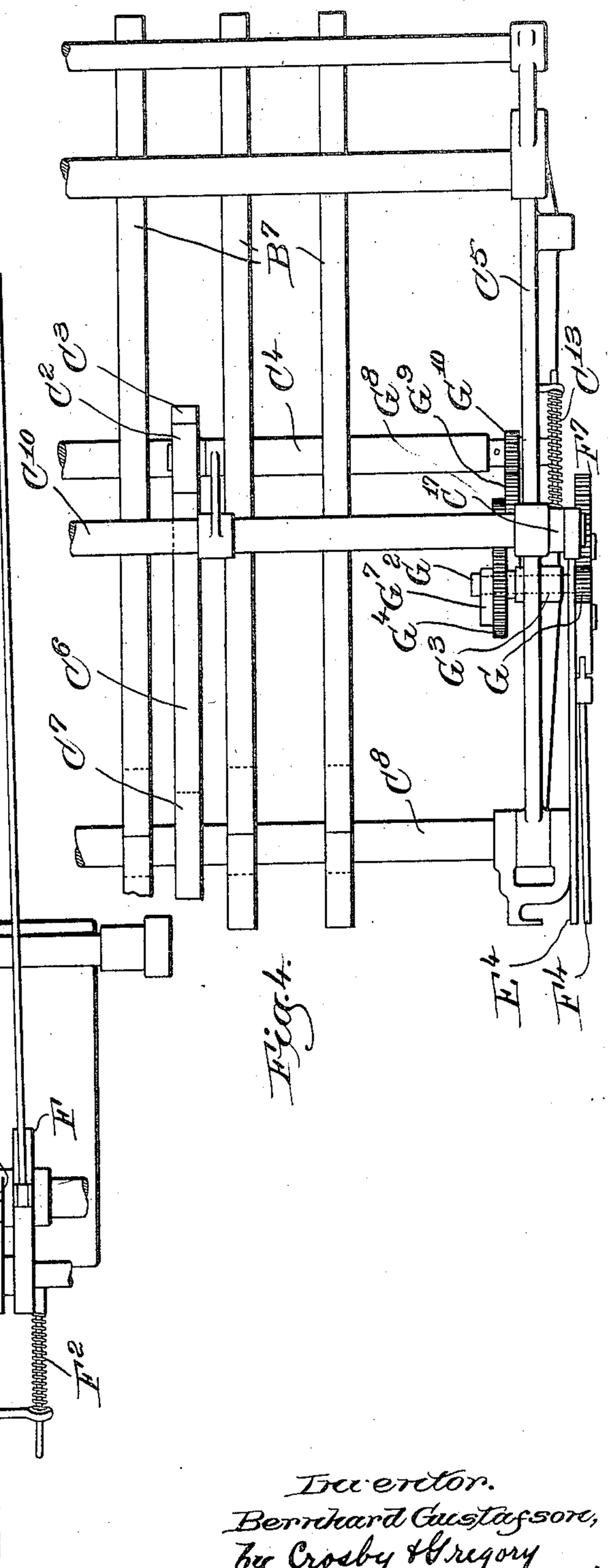

Fig. 4.

Witnesses.

Thomas J. Drummond.

Joseph M. Waid.

Inventor.

Bernhard Gustafsore,

by Crosby & Gregory

Atty's.

# UNITED STATES PATENT OFFICE.

BERNHARD GUSTAFSON, OF BOSTON, MASSACHUSETTS.

## SHEET-FEEDING MECHANISM.

934,608. Specification of Letters Patent. Patented Sept. 21, 1909.

Application filed June 2, 1908. Serial No. 436,213.

*To all whom it may concern:*

Be it known that I, BERNHARD GUSTAFSON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Sheet-Feeding Mechanism, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention relates to a sheet feeding mechanism for feeding sheets of paper in succession from an automatic sheet segregating device to a printing press or other machine for further acting upon or manipulating the sheets. In thus feeding the sheets in succession it is necessary to convey them at a high rate of speed, and at the same time present them in perfect alinement with the press gages or similar devices. It is also desirable to check the speed of the sheet just before it reaches the press gages in order to prevent buckling of the edge of the sheet.

With certain grades of paper it is impossible to feed every sheet exactly alike, and to position them properly against the press gages. A small variation will frequently occur so that the sheet is not in perfect register. It is planned to adjust and time the feeding mechanism so that the sheet at the end of its travel shall rest with its forward end squarely against the press gages. But no matter how carefully this be done variations frequently occur. In the present invention the mechanism may be so adjusted and timed as to stop the sheet either with its forward edge close to or against the press gages. The sheet is conveyed forward to either of these positions at a high rate of speed and is then manipulated in such a manner as to insure the perfect alinement of the sheet against the press gages. In this invention these results are secured by mechanism which releases the action of the conveying device upon the sheet at a predetermined time when its front edge is designed to be either close to or against the press gages; the mechanism then actuates the conveying devices momentarily to move the sheet and secure its accurate alinement against the press gages. In the operation of the device, therefore, the sheet comes forward at a high rate of speed, then comes to a complete stop either close to or against the press gages and is then given a light forward push to insure its alinement against the press gages.

The invention will more fully appear from the accompanying description and drawings and will be particularly pointed out in the claims.

The drawings, which show the preferred form of mechanism for embodying this invention, represent only so much of a sheet-feeding mechanism as is necessary to illustrate the invention, various parts of the mechanism being omitted for that purpose.

In the drawings, Figures 1 and 2 together constitute a side elevation of the mechanism, the left-hand end of Fig. 2 joining on to the right-hand end of Fig. 1. Fig. 2ª is a detail of the operating cams. Figs. 3 and 4 together constitute a plan view of the mechanism shown in Figs. 1 and 2, the left-hand end of Fig. 4 joining on to the right-hand end of Fig. 3, and the views being taken normal to the plane of the sheet-supporting sticks.

At the left-hand end of the drawings is represented a form of sheet segregating mechanism in which a pile of sheets A is shown mounted on a vertically-movable table B, and in which the individual sheets are being separated or combed out by a combing wheel $B^2$, the forward ends of the sheet passing up an inclined plane $B^3$, into the bight of delivery rolls $B^4$, $B^5$. The sheets when caught in succession by the delivery rolls $B^4$ and $B^5$, are fed forward at high speed upon and are supported by the parallel disposed sticks $B^6$ and $B^7$, until the forward ends of the sheets are caught in the bight of another pair of delivery rolls $C^2$, $C^3$. The rolls $C^2$ and $C^3$ are preferably driven at the same surface speed as the rolls $B^4$, $B^5$ and as soon as a sheet is caught by the former the cam $B^8$ actuates the lever $B^9$ to elevate the roll $B^4$ and release the rearward end of the sheet, which is thereupon controlled in its delivery by rolls $C^2$ and $C^3$.

The main features of the invention have to do with the final delivery of the sheet from the last set of sheet feeding devices until it is brought against and alined with the gaging devices, such as the press gages D illustrated. The sheet in the final portion of its travel to the press gages D rests upon and is supported by the sticks $B^7$. The last set of sheet feeding devices is herein shown as comprising oppositely disposed feed rolls

$C^2$. $C^3$ acting upon opposite sides of the sheet. The feed rolls $C^3$ are mounted upon a shaft $C^4$, journaled in the frame $C^5$, and preferably carry endless tapes $C^6$ running over idlers $C^7$ mounted on the shaft $C^8$. The upper rolls $C^2$ are journaled in arms $C^9$, projecting from the shaft $C^{10}$, mounted in the upright $C^{12}$ of the frame-work. The shaft $C^{10}$ is normally turned to cause the rolls $C^2$ to be held yieldingly toward the rolls $C^3$ by means of the spring $C^{13}$ abutting against the depending arm $C^{14}$ of the shaft, and the projection $C^{15}$ from the frame, the spring being retained in position by a rod $C^{16}$ pivotally connected to said arm $C^{14}$ and extending through the stud $C^{15}$. The rolls $C^2$ are raised against the action of the spring $C^{13}$ to release the sheet from the feeding action at the desired times, by the cam E, mounted on and driven from the shaft $E^2$, which cam actuates a lever $E^3$ connected at its upper end by a rod $E^4$ to the upwardly projecting arm $C^{17}$ of the shaft $C^{10}$.

In the construction shown the lower rolls $C^3$ are positively rotated. This rotation is caused at the desired times by the cam F mounted on and driven by the shaft $E^2$, which acts against the lever $F^3$, the said lever being held up against the cam by the spring $F^2$ similar in construction to the spring $C^{13}$ already described. A rod $F^4$ extends from the upper end of the lever $F^3$ and is pivotally connected at $F^5$ to a rack-bar $F^7$, sliding on grooved rolls $F^8$, and engaging a pinion G, fast on a stub-shaft $G^2$, mounted to rotate in a bearing $G^3$ in the frame. The shaft $G^2$ carries at its opposite end a gear $G^4$, loosely mounted thereon, and a ratchet $G^5$ fast thereon. The gear $G^4$ is provided with a pawl $G^6$ engaging the ratchet $G^5$, and held thereagainst by the spring $G^7$. It will thus be seen that upon the reciprocation of the rack $F^7$ toward the left the gear $G^4$ will be rotated in the direction of the arrow in Fig. 2, and upon the reciprocation of the rack in the opposite direction the gear will remain stationary and the pawl will slide over the ratchet. The gear $G^4$ intermeshes with the pinion $G^8$, fast to a gear $G^9$, and revolving on a stub-shaft projecting from the frame. The gear $G^9$ in turn engages a pinion $G^{10}$, fast on the shaft $C^4$. Hence, upon the reciprocation of the rack $F^7$ toward the left the shaft $C^4$ and with it the feed rolls $C^3$ will be given a rotation in the direction of the arrow in Fig. 2.

The mechanism is shown in the position in which it would be when a sheet conveyed forward by the rolls $B^4$ and $B^5$ presents its forward edge to the rolls $C^2$ and $C^3$. The shaft $E^2$ rotates in the direction of the arrow shown on the cam F in Figs. 1 and 2. At this time as the sheet enters the rolls $C^2$ and $C^3$ the rotation of the cam F swings the lever $F^3$ rapidly outward causing through the connections already described a rapid rotation of the rolls $C^2$ and $C^3$, and the consequent conveyance of the sheet at high speed down the inclined sticks $B^7$. The parts are so adjusted that the front edge of the sheet is designed to stop either close to or against the press gage D, and the elevation $E^{21}$ of the cam E is arranged to come against the lever $E^3$ at this time, and through the intermediate connections already described raise the feeding rolls $C^2$, thus separating the conveying devices; at the same time during the action of the elevation $E^{21}$ of the cam E, a concentric portion $F^{22}$ of the cam F is acting on the lever $F^3$ so that the rotation of the feeding rolls is stopped. Thus the conveying action of the rolls upon the sheet ceases and it thereupon at once comes to rest. Immediately thereafter, upon the continued rotation of the shaft $E^2$, the high portion $F^{21}$ of the cam F acting against the lever $F^3$ gives a slight further conveying rotation of the rolls $C^3$ and at the same time the depression $E^{22}$ of the cam E, acting against the lever $E^3$, allows the rolls $C^2$ to swing down into operative position for a moment. This last action of the conveying devices is momentary and gives a light push to the sheet, this light push being made more effective by the tapes $C^6$ already described. The result of this momentary and final propulsion of the sheet is to place the front edge of the sheet squarely up against the press gages and aline it correctly therewith.

During the usual side-registering of the sheet and while the press grippers seize the sheet, it is desirable to have the rolls $C^3$, as well as the tapes $C^6$, stationary, so as to prevent any misplacement of or rubbing against the sheet. This is secured by the ratchet mechanism already described which allows of the rotation of the gear $G^4$ and consequently the rolls $C^3$ in the forward or sheet conveying direction only. It will be seen that by means of the construction already described the sheets are always under perfect control, and a perfect alinement of the sheets is secured against the press gages, while at the same time the sheets are fed at a high rate of speed and in quick succession.

It will be noted that the frame-work $C^5$ is pivotally mounted in the usual way about the shaft $C^8$ so that it may be swung upwardly when desired. The other portions of the structure it is unnecessary to describe since they are not specifically involved in connection with this invention.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a sheet feeding mechanism the combination of sheet conveying devices, means for actuating them to convey the sheet forward until its front edge is close to or

against the press gages, means for thereupon releasing the action of said devices upon the sheet, and means for thereupon actuating the said devices momentarily to act upon the sheet and aline it against the press gages.

2. In a sheet feeding mechanism the combination of sheet conveying devices acting upon the opposite sides of the sheet, means for actuating said devices to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon separating said devices to bring the sheet to rest, means for momentarily bringing together and actuating said devices to act upon the sheet and aline it against the press gages.

3. In a sheet feeding mechanism the combination of sheet conveying devices, means for actuating them to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon stopping the action of said conveying devices, and means for thereupon momentarily actuating the said devices to give a final movement to the sheet and aline it against the press gages.

4. In a sheet feeding mechanism, the combination of a pair of sheet conveying rolls, means for actuating said rolls to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon separating said rolls to release the sheet, means for thereupon momentarily bringing together and actuating said rolls to act upon the sheet and aline it against the press gages.

5. In a sheet feeding mechanism, the combination of a pair of sheet conveying rolls, means for actuating said rolls to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon separating said rolls to release the sheet, means for thereupon momentarily bringing together and actuating said rolls to act upon the sheet and aline it against the press gages, and means for preventing the backward rotation of the rolls.

6. In a sheet feeding mechanism, the combination of a shaft, conveying rolls mounted thereon, a pinion, a rack engaging said pinion, a train of gears connecting said pinion with said shaft, a driving shaft, a cam carried thereby, said cam presenting a long eccentric portion, a short eccentric portion, and an ~~intermediate~~ concentric portion, means operated by the said portions of the said cam for causing the reciprocation of said rack and ~~the consequent~~ rotation of the conveying rolls, for then bringing the said rolls to rest, and for then causing a slight continued rotation of said rolls.

7. In a sheet feeding mechanism, the combination of a shaft, conveying rolls mounted thereon, a pinion, a rack engaging said pinion, a train of gears connecting said pinion with said shaft, a driving shaft, a cam carried thereby, said cam presenting a long eccentric portion, a short eccentric portion, and an intermediate concentric portion, a lever operated by the said portions of the said cam, a connection between said lever and said rack whereby the rack is reciprocated to cause the rotation of the conveying rolls, for then bringing the said rolls to rest, and for then causing a slight continued rotation of said rolls.

8. In a sheet feeding mechanism, the combination of a shaft, conveying rolls mounted thereon, a pinion, a rack engaging said pinion, a train of gears connecting said pinion with said shaft, a pawl and ratchet connection between said pinion and said shaft whereby rotation in but one direction is communicated from said pinion to said shaft, a driving shaft, a cam carried thereby and presenting a long eccentric portion, a short eccentric portion, and an intermediate concentric portion, means operated by the said portions of the said cam for causing the reciprocation of said rack in a forward direction and the consequent forward rotation of the conveying rolls, a subsequent bringing of the said rolls to rest, and a then subsequent slight continued forward rotation of said rolls.

9. In a sheet feeding mechanism, the combination of lower sheet feeding rolls and means for operating them, upper sheet conveying rolls, means for normally and yieldingly holding said rolls against the lower rolls, means for raising said upper rolls just prior to the final alinement of the sheet, and means for thereafter momentarily lowering said rolls to act upon the sheet and aline it.

10. In a sheet feeding mechanism, the combination of lower sheet conveying rolls, a rock-shaft, upper sheet conveying rolls upon said rock-shaft, means for yieldingly holding said rock-shaft to depress the upper rolls against the lower rolls, a driving shaft, two cams mounted thereon, intermediate connections between one of said cams and the lower feed rolls whereby upon the rotation of the driving shaft a sheet conveying rotation is given to said rolls, intermediate connections between the other of said cams and said rock-shaft whereby the upper rolls are raised just prior to the final alinement of the sheet and are then momentarily depressed to cause the final movement and alinement of the sheet.

11. In a sheet feeding mechanism the combination of sheet conveying devices, means for actuating them to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon releasing the action of said devices upon the sheet, and means for thereupon actuating the said devices momentarily to act upon the

sheet and aline it against the press gages, and means for thereupon again releasing the action of said devices upon the sheet, whereby opportunity is allowed for the action of side registering or other devices while the sheet is at rest.

12. In a sheet feeding mechanism the combination of sheet conveying devices acting upon the opposite sides of the sheet, means for actuating said devices to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon separating said devices to bring the sheet to rest, means for momentarily bringing together and actuating said devices to act upon the sheet and aline it against the press gages, and means for thereupon again separating said devices to bring the sheet to rest, whereby opportunity is allowed for side registering or other devices.

13. In a sheet feeding mechanism the combination of sheet conveying devices, means for actuating them to convey the sheet forward until its front edge is close to or against the press gages, means for thereupon stopping the action of said conveying devices, means for thereupon momentarily actuating the said devices to give a final movement to the sheet and aline it against the press gages, and means for thereupon stopping the action of said conveying devices, whereby opportunity is allowed for side registering or other devices while the sheet is at rest.

14. In a sheet feeding mechanism, the combination of a shaft, lower conveying rolls mounted thereon, coöperating upper conveying rolls, a driving shaft, a cam carried by said driving shaft, a lever engaging said cam, connections between said lever and the lower conveying roll shaft, a second cam carried by said driving shaft, a second lever engaging said second cam, connections between said second lever and said upper conveying rolls, whereby upon the rotation of the driving shaft the first cam will act to give a forward rotation to said lower conveying rolls, to then bring the said rolls to rest, and to then cause a slight continued rotation of said rolls, and a second cam will act to elevate the upper conveying rolls while the lower conveying rolls are at rest.

15. In a sheet feeding mechanism, the combination of a shaft, lower conveying rolls mounted thereon, coöperating upper conveying rolls, means for yieldingly depressing said upper conveying rolls against said lower conveying rolls, a driving shaft, a cam carried by said driving shaft, a lever engaging said cam, connections between said lever and the lower conveying roll shaft, a second cam carried by said driving shaft, a second lever engaging said second cam, connections between said second lever and said upper conveying rolls, whereby upon the rotation of the driving shaft the first cam will act to give a forward rotation to said lower conveying rolls, to then bring the said rolls to rest, and to then cause a slight continued rotation of said rolls, and the second cam will act to elevate the upper conveying rolls while the lower conveying rolls are at rest.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

BERNHARD GUSTAFSON.

Witnesses:
MABEL PARTELOW,
FREDERICK S. GREENLEAF.