E. R. KAST.

INSETTING MACHINE.

APPLICATION FILED JULY 30, 1912. RENEWED DEC. 1, 1916.

**1,236,445.**

Patented Aug. 14, 1917.

4 SHEETS—SHEET 1.

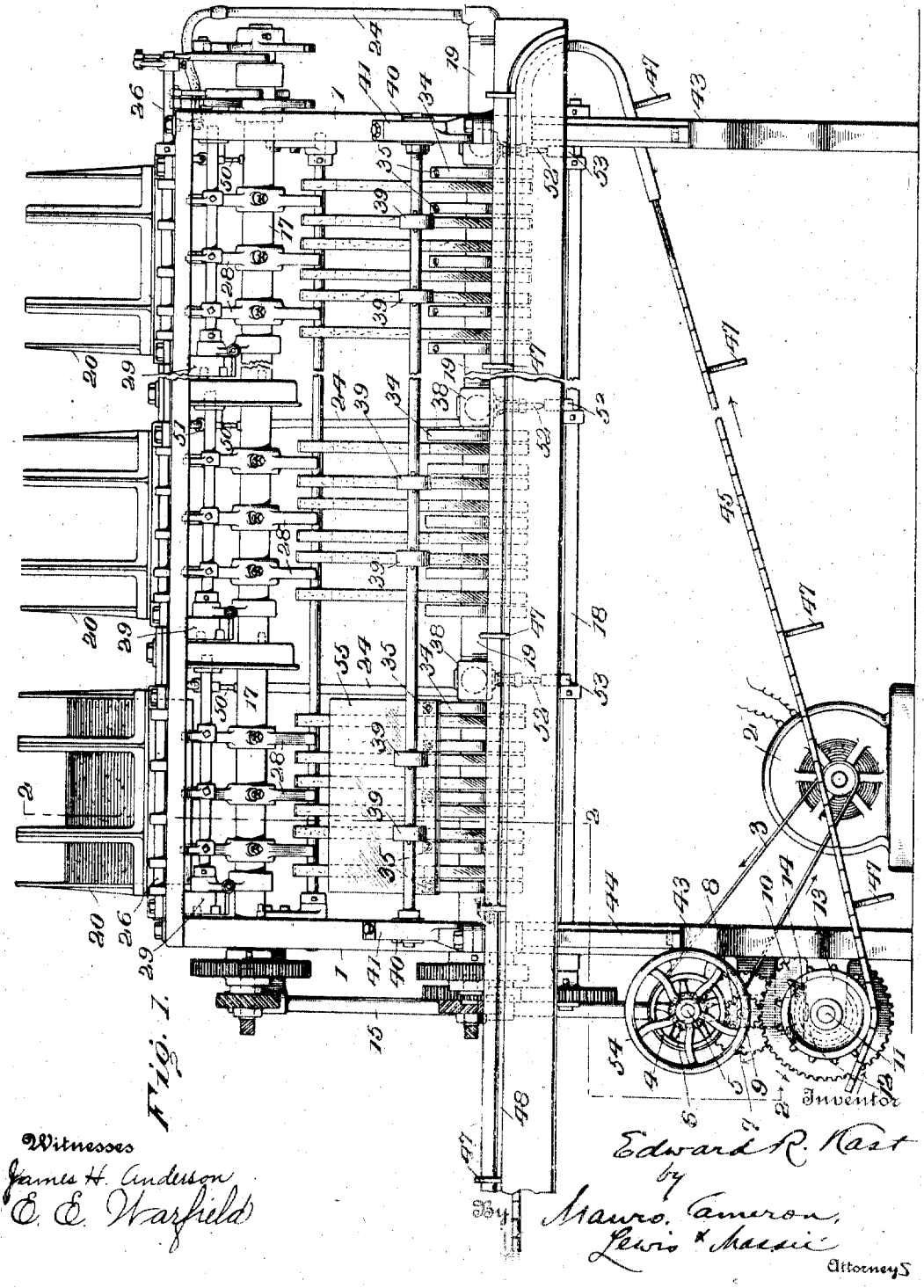

Fig. 1.

Witnesses

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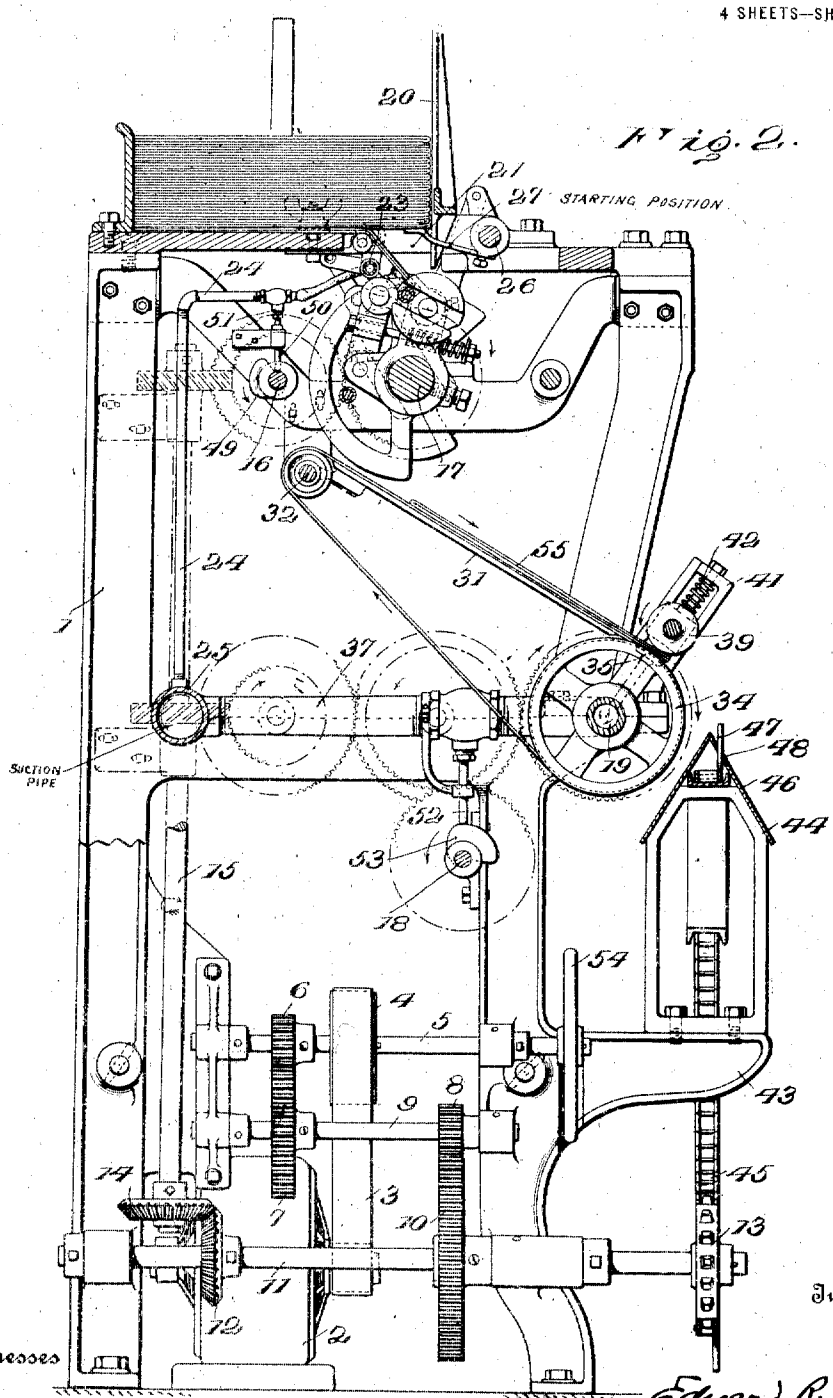
4 SHEETS—SHEET 2.

Fig. 2.

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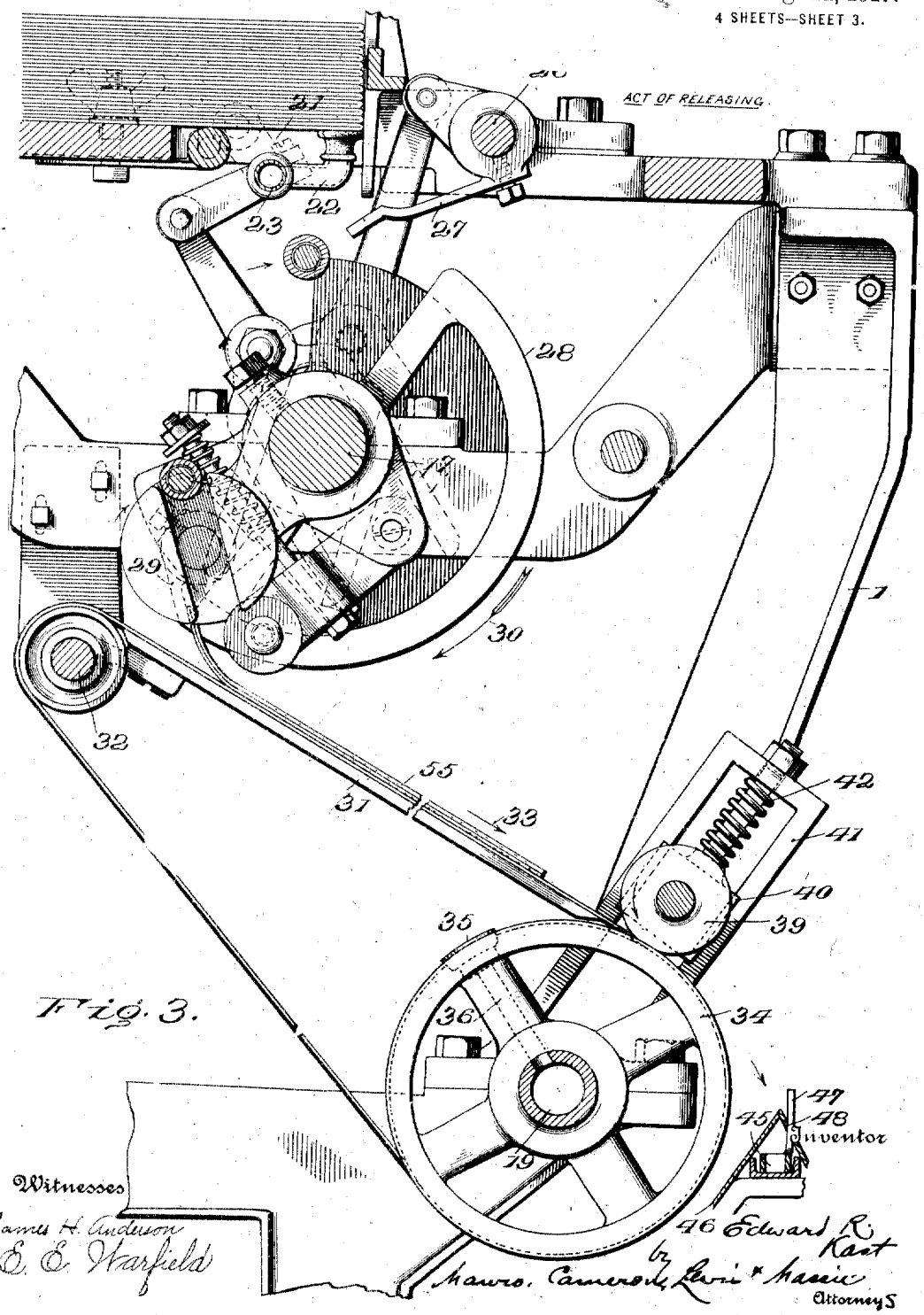


Fig. 3.

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4 SHEETS—SHEET 4.

Fig. 4.

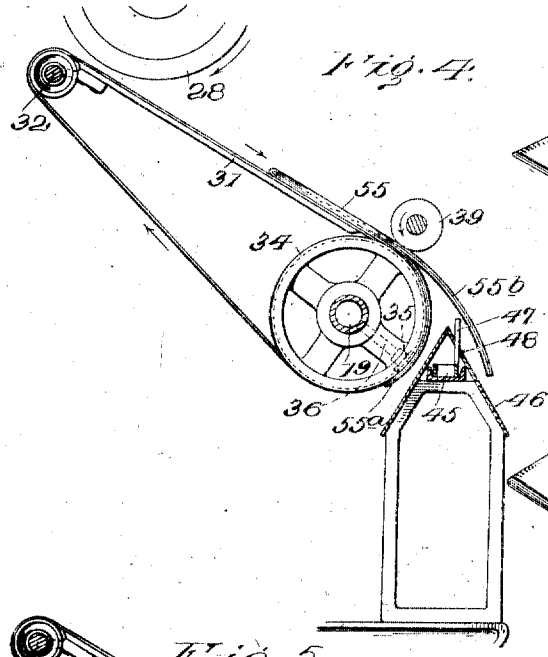



Fig. 7.

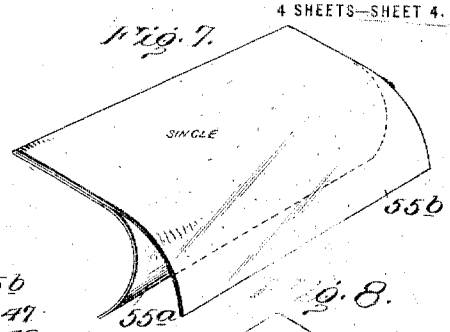



Fig. 8.

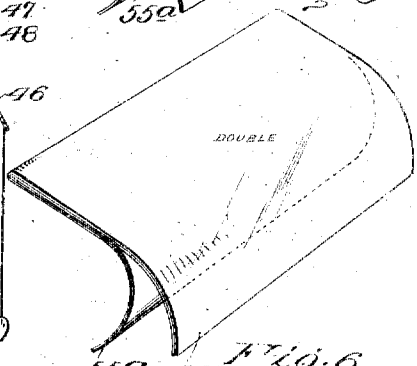



Fig. 5.

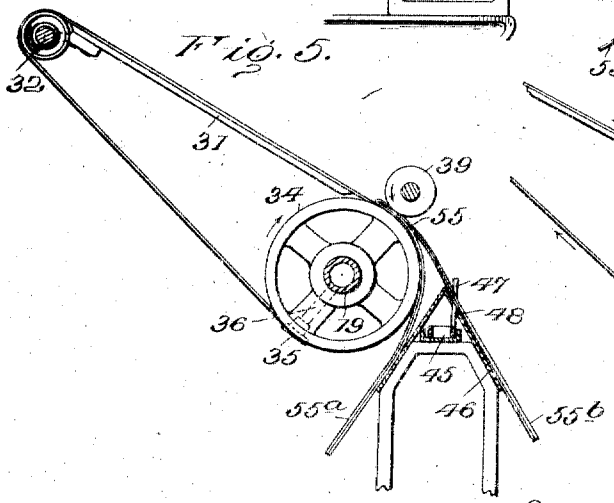



Fig. 6.

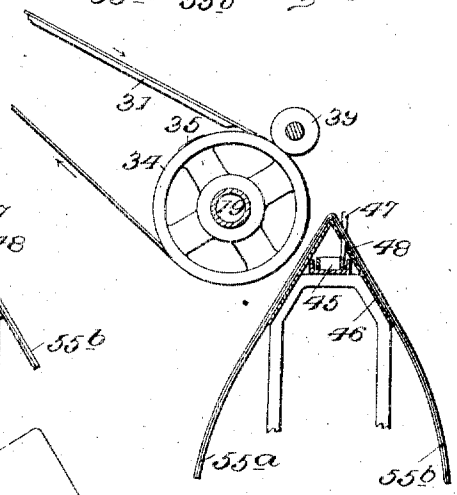
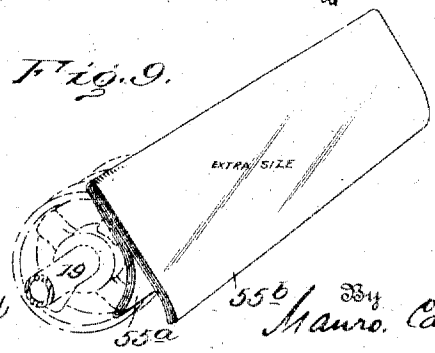



Fig. 9.




Witnesses

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# UNITED STATES PATENT OFFICE.

EDWARD R. KAST, OF BALTIMORE, MARYLAND, ASSIGNOR TO KAST INSETTING AND GATHERING MACHINE COMPANY, A CORPORATION OF DELAWARE.

## INSETTING-MACHINE.

1,236,445. Specification of Letters Patent. Patented Aug. 14, 1917.

Application filed July 30, 1912, Serial No. 712,315. Renewed December 1, 1916. Serial No. 134,504.

*To all whom it may concern:*

Be it known that I, EDWARD R. KAST, of Baltimore, Maryland, have invented a new and useful Improvement in Insetting Machines, which invention is fully set forth in the following specification.

This invention relates to the art of assembling printed sheets for "signatures" in the order desired for binding, and more particularly to that branch of the art wherein one folded sheet is inserted within the other or "inset." The present invention is an improvement on the machine set forth in my application Serial No. 508,160, filed July 17, 1909, and has for its object to simplify the construction of the machine described in said application, reduce the cost of manufacture thereof and increase its efficiency. In the machine described in said application, the insetting mechanism included, besides the hoppers or supports for the signatures and the means for withdrawing signatures from said hoppers, a pair of signature-opening rolls mounted on horizontal axes with the surfaces of the rolls in close proximity to each other, and means for holding the respective sides of the signature against the surfaces of the respective rolls in order to open the signature and then for releasing the signatures from the surfaces of the two rolls and allowing the opened signature to drop upon a table or support along which the signatures were advanced, to receive the next signature in the series.

The present invention consists of any suitable series of signature-receiving hoppers or supports, combined with any suitable means for withdrawing the signatures, one at a time, from said hoppers and supports and delivering the withdrawn signatures to an opening device, which consists of a single revolving cylindrical surface, which may be in the form of a roll like that shown in my previous application, and having any suitable means for holding that side of the signature which lies against the roll against the surface of the roll while it revolves, the other side of the signature being advanced in a line substantially tangent to the roll, but without being held in contact with or supported by an additional opening roll as in the previous application. Preferably, the device for withdrawing the signature from the hoppers delivers the withdrawn signature to a conveyer, such as a belt or series of belts, with the closed edge of the signature away from the opening roll and its opposite edge presented to the roll, and the movement of the belt serves to carry the signature into operative position on the opening roll. Preferably, the means for holding the side of the signature against the roll is in the form of a suction mouth or mouths, as in the opening rolls of my aforesaid application, which suction is broken at the proper time in any suitable manner or by any suitable means, such, for example, as an automatically operated valve which serves to admit the external air to the interior of the suction roll.

I also prefer to hold the signature against the surface of the opening roll at about the point where the signature first comes in contact with the suction mouth of said roll and the point where the upper side of the signature is approximately tangent to said roll, which means may assume any form suitable for the purpose. For the purpose of illustrating the invention, I have shown an idler roll to perform this function.

The machine as described is very much simpler in construction and less expensive to build and has material advantages over that disclosed in my previous application. For example, the machine of my aforesaid application would not successfully operate to inset signatures formed by folding the sheet twice upon itself, thus providing a signature with four leaves instead of two. With this class of signatures, the machine of my previous application would act to hold two of the leaves on one side of the signature to one of the opening rolls, and only one of the leaves on the other side of the signature to the other opening roll, leaving one of the interior leaves without any control being exerted thereon by the opening rolls and thus materially interfering with the insetting work.

By the machine of the present invention, on the other hand, the opening roll takes the two united leaves on one side of such a compound signature and carries them around therewith, while the other two leaves of the signature are advanced outward in a line approximately tangent to the opening roll

at the point where the suction mouth of the roll first takes hold of the signature. This acts to open the signature, and, as it is advanced, the two leaves of the signature which are proceeding along the tangent pass outward over and beyond the apex of the saddle or table upon which the signature is to be dropped, and, when the suction roll releases the other two leaves of the compound signature, the signature falls across the saddle with two of its leaves on one side thereof and the other two on the other side thereof; that is, with the signature open in its center and resting upon the saddle.

The invention furthermore consists in certain details of construction, and combination and arrangement of parts to be more fully hereinafter described and then pointed out in the claims. The inventive idea is capable of being embodied in a variety of mechanical structures, one of which, for the purpose of illustrating the invention is shown in the accompanying drawings, in which drawings—

Figure 1 is a front elevation of the machine;

Fig. 2 is a vertical transverse section on the line 2—2 of Fig. 1, parts of the operating gear being shown in dotted lines;

Fig. 3 is a broken detail view of the upper portion of Fig. 2, being shown on a large scale for better understanding of the construction;

Figs. 4, 5 and 6 are broken details for illustrating the manner in which the signature is delivered by the opening roll to the table or saddle;

Fig. 7 is a view illustrating the manner in which a single signature is opened; and

Figs. 8 and 9 are like views illustrating the manner in which compound signatures are opened.

Referring to the drawings, in which like reference numerals indicate like parts, 1 is the frame of the machine of any suitable or desired construction. Any suitable means may be employed for supplying power to the machine, which means are shown in the form of an electrical motor 2 driving the belt 3, which acts, through a pulley 4 and shaft 5, to drive a gear 6, which in turn acts, through gears 7 and 8 on the counter-shaft 9 and gear 10 on shaft 11, to drive a bevel gear 12 and a sprocket wheel 13 keyed to said shaft 11. The bevel gear 12 acts, through bevel gear 14, to drive the upright shaft 15, which in turn propels the horizontal shafts 16, 17, 18 and 19 extending throughout the length of the machine, any suitable connecting gearing between the shaft 15 and the said horizontal shafts 16, 17, 18 and 19 being provided for this purpose.

Mounted on top of the machine are a series of signature-receiving hoppers or supports 20, 20, in which the signatures are placed in the order in which they are to be inserted, and immediately under the forward open bottom 21 of these hoppers is the signature-withdrawing mechanism, consisting of suckers 22 mounted on a hollow rock shaft 23, which shaft is connected by pipe 24 with the suction pipe 25, which latter pipe is connected in any suitable manner with an exhaust, not shown. Mounted in the framework of the machine immediately in front of the hoppers is the rock shaft 26 bearing the signature-supporting fingers 27, which support the folded forward edges of the signatures in the hoppers when the suckers 22 are lowered.

Under the respective hoppers on the shaft 17 are mounted a series of signature-withdrawing devices 28, which seize the folded edges of signatures when they are lowered by the suckers and withdraw the bottom signature from the pile in the hoppers. These are in the form of semi-cylindrical surfaces keyed to the shaft 17 and provided with a suitable clamping surface against which the signatures are clamped by fingers 29 for withdrawing the same from the hoppers, as described in detail in my application above mentioned. These withdrawing devices revolve in the direction indicated by the arrow 30, Fig. 3, and, when the signature has been entirely withdrawn from the hopper and carried to the proper position, it is automatically released by the withdrawing device and advanced to the opening roll.

The preferred form of signature-withdrawing device is that shown, described and claimed in my aforesaid application, and, as the specific construction thereof forms no part of the present invention, it need not be more fully described herein.

The signature having been withdrawn, it falls from the signature-withdrawing device on to a signature conveyer or belt 31 driven from shaft 32 in the direction indicated by the arrow 33, Fig. 3, the belt 31 passing around grooves or depressions in the surface of the signature opening roll 34 on the hollow shaft 19, the signature being deposited upon the belt with its folded edge away from the roll and its opposite edge directed toward the roll. This roll 34 has a suction mouth 35 on its surface connected by a suitable tube 36 with the interior of the hollow shaft 19, which shaft in turn is connected at intervals along its length with the suction pipe 25 through the medium of tubes 37, which extend forward to the bearings 38, Fig. 1, for the shaft 19, the connections between the interior of the hollow shaft 19 and the tubes 37 being through the bearings 38, which are suitably constructed for that purpose.

Mounted above the rolls 34 are suitable

devices for holding the signature in intimate contact with the roll at the point where the belt 31 delivers the signature to the roll, which devices are here shown in the form of a roller 39, Fig. 3, mounted in bearings 40, which bearings are capable of moving toward and from the roll 34 in a supporting frame 41 carried by the framework of the machine, a spring 42 being preferably employed to hold the roll 39 yieldingly in contact with the opening roll 34.

Mounted in brackets 43 in front of the framework of the machine is the saddle 44, which is preferably inverted V-shaped in cross-section, and a sprocket chain 45 driven from the sprocket wheel 13 travels in a suitable track or way 46, Fig. 3, mounted below the apex of the saddle 45 and having followers 47, which are secured to the sprocket chain 45 and project outward through a slot 48 in the front side wall of the saddle, said followers 47 being suitably spaced to advance the series of signatures along the saddle.

For the purpose of controlling the suction in the suckers 22 at the proper instant, a series of cams 49, are mounted on shaft 16 which coöperate with the stems 50 of valves 51 in the pipe 24 (see Figs. 1 and 2). These valves normally drop by their own weight so as to open the pipes 24 to the external atmosphere, but, at the instant when the suckers are in action to pull down the folded edge of the signatures from the hoppers, the valves are closed by the action of the cams 49 coming in contact with the stems 50 of the valves and raising the same.

In like manner, the pipes 37 are provided with valves whose stems 52 extend downward in a position to be actuated by cams 53 on shaft 18, the operation of the cams being so timed that the valves will be raised to close the suction pipes 37 at the time when suction is desired in the opening rolls to hold one of the sides of the signature in contact therewith and the stems 52 of the valves being released by the cam at the time when it is desired to release the side of the signature from the suction mouth of the roll.

For the purpose of operating the machine through a very slight degree without turning power on to the machine, a wheel 54, Fig. 2, is secured to the shaft 5 and the operator, by turning said wheel, may give a slight movement to the parts of the mechanism.

At the instant when the signature 55, Fig. 3, is delivered to the belt 31 and is in the act of being released by the clamp 29 of the signature-withdrawing device 28, the sucker mouth 35 on the opening roll 34 is just approaching the point where the roll 39 contacts with the roll 34, as clearly illustrated in Fig. 3. As the roll advances, the signature 55 is carried by the belt 31 down between the rolls 34 and 39, and, as the forward open end of the signature enters between the rolls 34 and 39, sucker mouth 35 on the opening roll comes in contact with one side of the signature and the valve in the pipe 37 is closed by the action of the cam 53 on the shaft 18, and the suction acts to hold the lower side of the signature to the roll 34 when the continued revolution of the roll advances the signature with the lower side $55^a$ thereof held to the signature roll, while the upper side $55^b$ thereof is advanced in a line approximately tangent to the opening roll, as shown in Fig. 4, so that its outer edge extends out over the saddle 46, as clearly shown in Fig. 4. Upon the further operation of the opening roll, the signature is still further advanced with one side of the signature on the forward side of the saddle, the other side of the signature on the rear side of the saddle, and the cam 53 is withdrawn from the stem 52 of the valve 57, thereby breaking the suction and freeing the side $55^a$ from the opening roll, as shown in Fig. 5. The further revolution of the opening roll advances the signature until it escapes from between the rolls 34 and 39 and drops upon the saddle, as shown in Fig. 6.

When the signatures to be inset are compound signatures, that is, when the sheet is folded more than once, the signatures are placed in the hoppers with the closed edge of the signature to the front of the machine (that is, to the right in Fig. 2) and with the open edge to the left of said figure. If the folds of the signature are parallel the upper side of the signature, that is, the two upper leaves thereof, are united and the signature-withdrawing devices 28, in withdrawing the signature, turn it entirely over, so that the lower two leaves of the signature, when the same is placed upon the belt 31, are also united at their lower edge, while the two upper leaves are separated at their lower edge, that is, are not connected by a fold. And when the opening roll carries the lower leaf of the compound signature around with it, it necessarily carries the leaf or leaves to which the same is connected by the fold at its lower edge, thereby opening the signature at its middle portion, while all of the leaves of the signature above the middle portion advance in a line approximately tangent to the opening roll 34, as shown in Fig. 4, so that, whether the signature be a compound or a simple signature, it is opened always at its middle, and the signature thus opened is placed upon the saddle. When the signatures, whether simple or compound, are placed upon the saddle, they are advanced by the followers 47 on the sprocket chain 45 reaching a position in front of the next hopper and signature-withdrawing de-

vice in time to receive the next signature of the series, as will be readily understood by those skilled in this art.

By "compound" signature is meant a sheet folded more than once, and whether the folds are parallel or at right-angles one to the other. It is pointed out that the device will work equally well with compound signatures having folds at right-angles one to the other.

By reason of the position of the table or saddle 44 in the extreme front portion of the machine, the signatures upon the table may be readily inspected by the operator and conveniently reached in case of any accidental displacement or in case it becomes necessary, for any other reason, for the operator to get at the signatures.

Having thus described my invention, what is claimed is:

1. An insetting machine including, in combination, a support for opened signatures, an inclined member down which the signatures are fed open edge foremost, and signature-opening means receiving the signatures from said member and carrying one leaf thereof to one side of the support and permitting the other leaf to project outward over the other side thereof.

2. An insetting machine including, in combination, a support for opened signatures, an inclined conveyer down which the signatures are fed open edge foremost, and signature-opening means receiving the signatures from said conveyer and carrying one leaf thereof to one side of the support and permitting the other leaf to project outward over the other side thereof.

3. An insetting machine including, in combination, a support for opened signatures, an inclined member down which the signatures are fed open edge foremost, signature-opening means receiving the signatures from said member and carrying one leaf thereof to one side of the support and permitting the other leaf to project outward over the other side thereof, and a rotary member coöperating with said signature-opening means and engaging the upper face of said projecting leaf.

4. An insetting machine including, in combination, a support for opened signatures, an inclined conveyer down which the signatures are fed open edge foremost, signature-opening means receiving the signatures from said conveyer and carrying one leaf thereof to one side of the support and permitting the other leaf to project outward over the other side thereof, and a rotary member coöperating with said signature-opening means and engaging the upper face of said projecting leaf.

5. An insetting machine including, in combination, a support for opened signatures, an inclined member down which the signatures are fed open edge foremost, and a single signature-opening roll carrying one leaf thereof to one side of the support and leaving the other leaf free to project outward over the other side thereof.

6. An insetting machine including, in combination, a support for opened signatures, an inclined conveyer down which the signatures are fed open edge foremost, and a single signature-opening roll carrying one leaf thereof to one side of the support and leaving the other leaf free to project outward over the other side thereof.

7. An insetting machine including, in combination, a support for opened signatures, an inclined member down which the signatures are fed open edge foremost, a single signature-opening roll carrying one leaf thereof to one side of the support and leaving the other leaf free to project outward over the other side thereof, and a roller coöperating with said signature-opening roll and engaging the upper face of said projecting leaf.

8. An insetting machine including, in combination, a support for opened signatures, an inclined conveyer down which the signatures are fed open edge foremost, a single signature-opening roll carrying one leaf thereof to one side of the support and leaving the other leaf free to project outward over the side thereof, and a roller coöperating with said signature-opening roll and engaging the upper face of said projecting leaf.

9. An insetting machine including, in combination, a series of hoppers, means for withdrawing signatures from each hopper, an inclined support for each hopper on which the withdrawn signatures are deposited and down which they are fed open edge foremost, means for receiving and progressing opened signatures along the series of hoppers, and signature-opening means for each hopper receiving the signatures from said inclined support and carrying one leaf of each signature to one side of the receiving and progressing means and permitting the other leaf to project outward over the other side thereof.

10. An insetting machine including, in combination, a series of hoppers, means for withdrawing signatures from each hopper, an inclined support for each hopper on which the withdrawn signatures are deposited and down which they are fed open edge foremost, means for receiving and progressing opened signatures along the series of hoppers, signature-opening means for each hopper receiving the signatures from said inclined support and carrying one leaf of each signature to one side of the receiving and progressing means and permitting the other leaf to project outward over the other side thereof, and a rotary member coöperating

with said signature-opening means and engaging the upper face of said projecting leaf.

11. In a book or pamphlet-making machine, the combination of a single signature-opening member which engages one leaf of each signature and separates it from the other, a conveyer arranged at an acute angle to said member delivering signatures thereto open edge foremost, and a support on which the opened signatures are deposited.

12. An insetting machine including, in combination, a signature-receiving support, a signature-opening roll provided with means for retaining one leaf of the signature against the surface of the roll, whereby said leaf is carried to one side of the support and the other leaf is left free to project on the other side of the support, an idler roll closely approaching the signature-opening roll and holding said signature in contact with the opening roll as the signature passes between the same and the idler roll, and an inclined conveyer presenting the signature open edge foremost to said signature-opening roll.

13. An insetting machine including, in combination, a revolving cylindrical surface, a signature-receiving support, a hopper for the supply of signatures, means for withdrawing signatures one at a time from said hopper, an inclined conveyer presenting the withdrawn signatures to said cylindrical surface open edge foremost, and means holding one of the leaves of the signature against said cylindrical surface whereby the other leaf thereof projects approximately tangent thereto over the support.

14. An insetting machine including, in combination, a series of signature hoppers or supports, a signature-receiving support, a series of signature-opening rolls carrying one leaf of each of a series of signatures to one side of the support and leaving the other leaves of said series of signatures free to project on the other side of said support, means for withdrawing a signature from each of said hoppers, and inclined conveyers receiving said signatures and presenting them open edge foremost to said rolls.

15. An insetting machine including, in combination, a signature-receiving saddle, a signature-opening roll placed in close proximity thereto with its axis on one side of the vertical longitudinal medial plane of the saddle, said roll carrying one leaf of the signature to one side of the saddle and leaving the other leaf free to project on the other side of the saddle, and an inclined conveyer presenting the signature open edge foremost to said roll.

16. In an insetting machine, a plurality of hoppers for signatures, means simultaneously removing a signature from each hopper, a single rotary signature-opening member for each hopper, and a support on which the opened signatures are deposited and assembled in inset relation.

17. In an insetting machine, a plurality of hoppers for signatures, a single signature-opening member for each hopper, means for simultaneously removing a signature from each hopper and feeding it to its respective signature-opening member, and a support on which the opened signatures are deposited and assembled in inset relation.

18. In an insetting machine, a plurality of hoppers for signatures, a single signature-opening member for each hopper, means for simultaneously removing a signature from each hopper and feeding it to its respective signature-opening member open edges foremost, and a support on which the opened signatures are deposited and assembled in inset relation.

19. In an insetting machine, a plurality of hoppers for signatures, a single rotary member for each hopper provided with means for removing one ply of a signature from the other ply, means for feeding signatures to said rotary member, and a support on which the signatures are deposited.

20. In an insetting machine, a plurality of hoppers for signatures, a single rotary member for each hopper provided with means for removing one ply of a signature from the other ply, means for withdrawing signatures from the hoppers and feeding them to said rotary member, and a support on which the signatures are deposited.

21. In an insetting machine, a plurality of hoppers for signatures, a single rotary member for each hopper provided with means for removing one ply of a signature from the other ply, means for withdrawing signatures from the hoppers and feeding them to said rotary member, a support on which the signatures are deposited with one ply of a signature on one side of the support and the other ply on the other, and means for progressing signatures along said support.

22. In an insetting machine, a plurality of hoppers for signatures, a single member for each hopper operating to separate the ply or plies on one side of the fold from the ply or plies on the other, means for feeding signatures to said members, a support on which a plurality of opened signatures are simultaneously deposited, and means progressing signatures along said support whereby they are assembled in inset relation.

23. In an insetting machine, a plurality of hoppers for signatures, a single suction member for each hopper operating to separate the ply or plies on one side of the fold from the ply or plies on the other, means for feeding signatures to said members, a support on which a plurality of opened signa-

tures are simultaneously deposited, and means progressing signatures along said support whereby they are assembled in inset relation.

24. In an insetting machine, a plurality of hoppers for signatures, a single rotary suction member for each hopper operating to separate the ply or plies on one side of the fold from the ply or plies on the other, means for feeding signatures to said members, a support on which a plurality of opened signatures are simultaneously deposited, and means progressing signatures along said support whereby they are assembled in inset relation.

25. In an insetting machine, a plurality of hoppers for signatures, a single member for each hopper operating to separate the ply or plies on one side of the fold from the ply or plies on the other, means for feeding signatures to said members, an inverted V-shaped support on which a plurality of opened signatures are simultaneously deposited, and means progressing the opened signatures along said support whereby they are assembled in inset relation.

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

EDWARD R. KAST.

Witnesses:
S. T. CAMERON,
J. E. MCGINLEY.