No. 853,910. PATENTED MAY 14, 1907.

E. TYDEN.

SHEET SEPARATING DEVICE FOR SHEET FEEDING MACHINES.

APPLICATION FILED NOV. 18, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

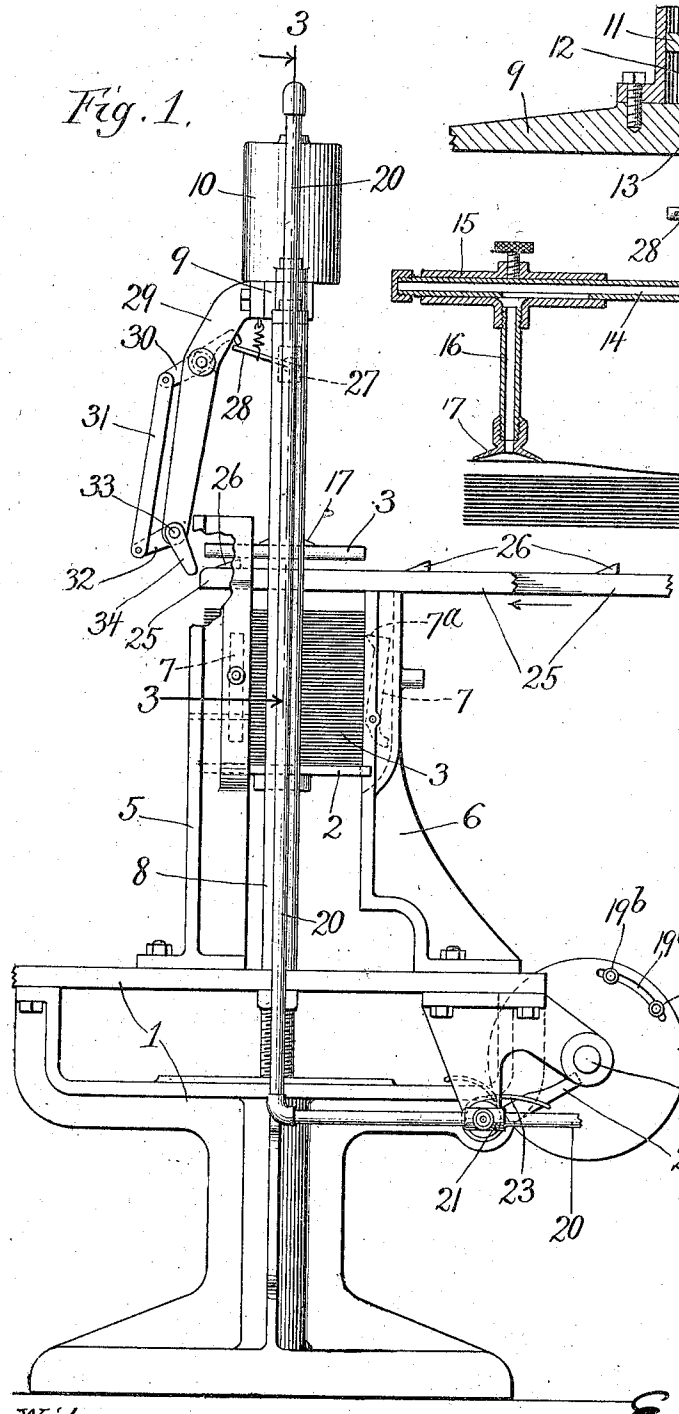


Fig. 3.

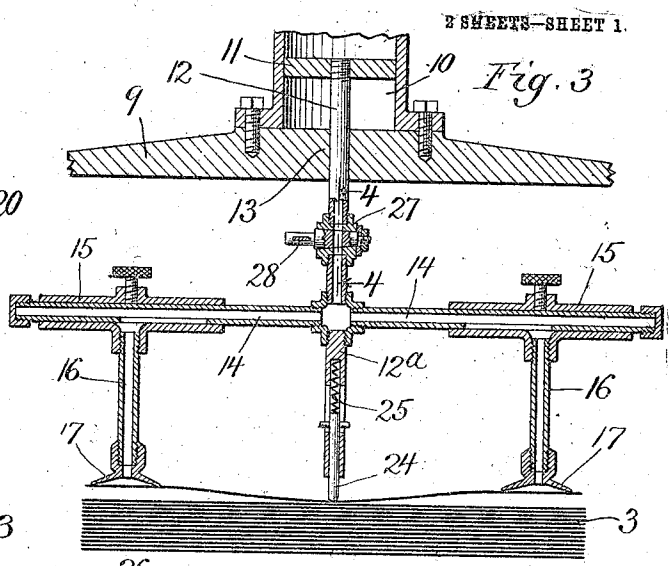
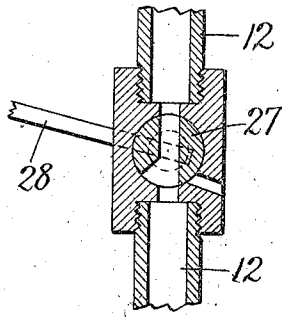


Fig. 4.



Witnesses.
Edward T. Wray.
J. S. Abbott

Inventor.
Emil Tyden
by Burton & Burton
his Attys.

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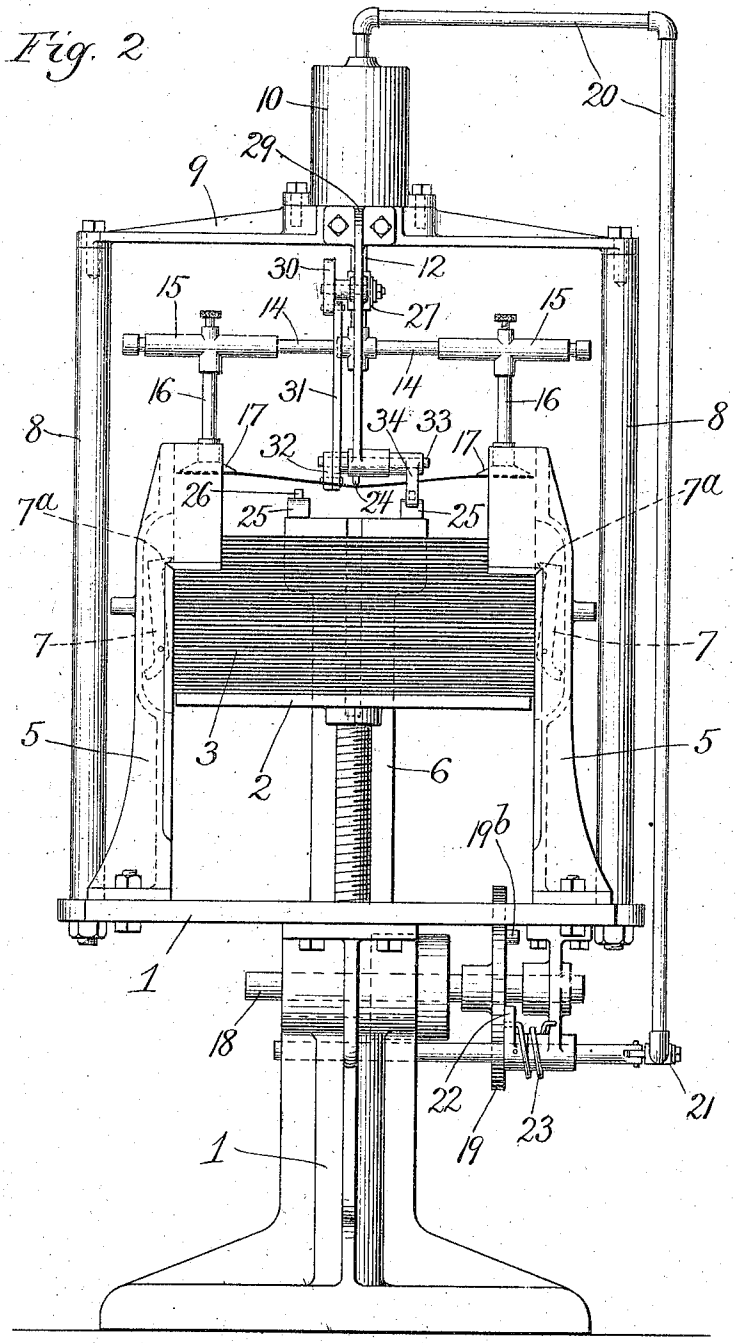
2 SHEETS—SHEET 2

Fig. 2



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UNITED STATES PATENT OFFICE.

EMIL TYDEN, OF HASTINGS, MICHIGAN.

SHEET-SEPARATING DEVICE FOR SHEET-FEEDING MACHINES.

No. 853,910. Specification of Letters Patent. Patented May 14, 1907.

Original application filed June 8, 1905, Serial No. 264,217. Divided and this application filed November 18, 1905. Serial No. 288,051.

To all whom it may concern:

Be it known that I, EMIL TYDEN, a citizen of the United States, residing at Hastings, in the county of Barry and State of Michigan, have invented new and useful Improvements in Sheet-Separating Devices for Sheet-Feeding Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This application is a division of my application No. 264,217, filed June 8, 1905.

The purpose of the invention covered by this divisional application is to provide devices for separating from a pile individual sheets of metal, paper, card or other sheet material for the purpose of feeding such sheets to the machine for operating upon them.

It consists of the features and elements of construction set out in the claims.

In the drawings:—Figure 1 is a side elevation of a portion of a sheet-feeding mechanism containing the present invention, only so much of the machine being shown as necessary to illustrate the invention. Fig. 2 is a rear side elevation of the same. Fig. 3 is a section at the line 3—3 on Fig. 1. Fig. 4 is a detail section at the line 4—4 on Fig. 3 upon an enlarged scale.

The machine as shown in the drawings comprises a frame, upon the lower part of which there may be mounted mechanism for supporting and advancing the pile of sheets from which the top sheets are to be detached for feeding onward to mechanism which is to operate upon such sheets individually.

The parts of the machine for advancing the pile and bringing the top sheets into reach of the separating devices are shown only so far as unavoidable in showing such separating devices and need not be particularly described, but for understanding of so much as appears in the drawing the following brief description is given.

Upon the frame, 1, there is mounted a platen, 2, for supporting a pile of blanks, 3, and any suitable means may be employed for advancing the pile upwardly to keep its top within reach of the separating devices for taking off the top sheets. In the machine shown, the pile is thus advanced upwardly between guide posts, 5, 5 and 6, and on these guide posts there are mounted dogs, 7, having noses, 7^a, at their upper ends which engage under the bottom of the pile when the platen has lifted the pile past these noses, and the remnant of the pile is carried on these dogs while the platen descends to receive another pile. The details of the mechanism for effecting these movements is not herein claimed nor fully shown and need not be described, the same being part of the subject matter of my said application No. 264,217.

At opposite sides of the path of the platen and of the pile of blanks carried thereon, the frame has two posts, 8, 8, erected rigidly. These posts are connected at their upper end by a cross-head, 9, upon the upper side of which there is mounted a downwardly open cylinder, 10, having a piston, 11, with its stem, 12, projecting out at the lower end of the cylinder and through a guide bearing, 13, rigid with the cross-head. The stem of the piston is hollow and opens above the piston into the cavity of the cylinder. At the lower end and below the cross-head it has oppositely projecting horizontal tubular arms, 14, 14, on which respectively are sleeved the horizontal members of T fittings, 15, 15, whose vertical members are connected by pipe sections, 16, 16, with suction mouths, 17, 17, mounted at the lower end of said pipe sections and designed and adapted for grasping by suction the blanks upon whose surface they may press for lifting them from the pile. A shaft, 18, is journaled on the frame for affording operating power connections with the various mechanisms thereon, has rigid with it a disk, 19, which has a segmental slot, 19^a, in which are mounted and adjustably secured two abutments, 19^b, 19^b, being preferably roll-carrying studs jutting off from one face of the disk.

A pipe, 20, leading from any source of rarefied air (not shown) for the purpose of producing suction, is mounted on the frame, 1, and extends at proper position up alongside one of the standards, 8, and is connected into the top of the cylinder, 10, for producing suction therein above the piston to cause the latter to be withdrawn into the cylinder. It

will be seen that the same connection affords communication with the suction mouths or suckers, 17, 17, through the hollow stem, 12, of the piston and the connections above described. A valve, 21, in the pipe, 20, at the lower side and near one end of the frame, 1, has a lever arm, 22, extending alongside the disk, 19, in position to be encountered by the projecting abutments, 19^b. The valve, 21, is held normally by a spring, 23, open for communication with the source of exhaust for rarefied air, and is constructed for closing such communication and venting or admitting atmospheric air to the pipe, 20, and its connections. When the valve is in this normal position, the lever arm, 22, stands in position to be encountered by the abutments, 19^b, and to be moved thereby for shifting the valve to cut off communication with the source of rarefied air and vent the pipe, and the valve will be so held until the second of these abutments passes off the lever arm, and thus by the adjustment of the two abutments in the slot the time of shifting said valve and the length of time it is held in position for venting the pipes will be regulated.

When the valve, 21, is in position to cut off communication with the source of rarefied air and to open communication of the pipe, 20, with the atmosphere, the piston, 11, and the parts connected with its stem descend by gravity until the suction mouths, 17, rest upon the upper surface of the upper blank of the pile, which may be either upon the platen, 2, or rest upon the dogs, 7. The margins of the suction mouths are adapted for making air-tight contact with a smooth surface, such as the surface of the blanks, and the weight of the device including the piston and the pipe connections therefrom to the mouths is sufficient to insure such air-tight contact. In addition to the two suction mouths carried on the cross pipes, 14, 14, the piston, 11, carries at a point intermediate said two mouths and preferably in the vertical fore-and-aft plane of the axis of the piston a presser, 24, which protrudes normally below the horizontal plane of the lower margins of the mouths, 17, so that it encounters the upper surface of a blank on the top of the pile before the encounter of the mouths therewith. This presser is mounted as a plunger in the extension, 12^a, of the stem, 12, below the cross pipes, 15, and is held yieldingly protruded, as described, by a spring, 25, back of it in the tubular extension of the piston stem. When the valve, 21, is set for cutting off communication with the source of rarefied air and for admitting atmospheric air to the pipe, 20, the piston, 11, and all parts connected therewith descend by gravity until the presser, 24, and the suction mouths, 17, are stopped by contact with the upper blank of the pile on the platen or on the dogs, 7, the presser encountering the blank first, but the weight of the entire descending elements being sufficient to overcome the distance of the spring, 25, back of the presser and cause the suction mouths to come into air-tight contact with the surfaces of the blank. The position of the abutments, 19^b, on the disk, 19, and the interval between them along the slot, 19^a, will be calculated and adjusted so that after the valve, 21, is set, as described, for admitting atmospheric air to the cylinder to permit the piston to fall, it shall be held in such adjustment long enough to permit the action by gravity above described, and then the last abutment, 19^b, having run off the end of the lever arm, 22, the valve, 21, will be reversed by the spring, 23, to the position at which atmospheric communication with the pipe, 20, will be closed and communication with the source of rarefied air opened. This causes two effects: First, suction operating through the suction mouths, 17, will hold the blanks firmly to said mouths; secondly, the piston, 11, will be forced upward by atmospheric pressure in opposition to the reduced air tension in the cylinder above the piston, and the entire lifting device carried by the piston will be moved upward. The blank engaged by the suction mouths or suckers, 17, at opposite sides of the presser will be lifted at two opposite edges but will be held down at the intermediate point while the presser, 24, rests upon it to such extent as the tension of the spring, 24, may be adequate to bow or bend the blank. Such bowing or bending of the blank will operate to detach it from the next succeeding blank if the latter for any reason tends to adhere to it or be lifted with it.

In the case of metal blanks which have been cut out with the same die, there is frequently a slight feather or bur at the edges, causing the blanks to be engaged with each other by the interlocking of the similar burs, but the curvature of the blanks about the line at which the presser bears upon them causes the lower blank to slide slightly upon the upper one at the two ends and the interlocked burs are thus disengaged; also, when adhesion happens by reason of oil or other liquid between the blanks, the slight sliding caused by the bowing of the blanks tends to break the adhesion. In both cases, the lower blank reacting from the bending to which it has been subjected by adhesion to the upper blank straightens itself back on to the pile while the top blank remains engaged by the suckers at the end and bowed down in the middle by the presser. This springing action between the first blank and the next succeeding blank will happen upon the very first lifting action causing the bowing, and said lifting action continuing as the piston

rises, the upper blank fully detached from the one next below is carried up from the pile as the piston continues its ascent.

When this device is used for the purpose of supplying blanks to a machine which is to act upon them in subsequent processes, either as a part of such machine or as a part of a feeding machine, a suitable element is provided to enter between the detached blank and the pile and engage it by its rear edge for feeding it onward to the subsequent machine. Such an element is represented in the drawings by the parallel feed bars, 25, 25, having spring dogs, 26, operating as ratchet teeth projecting upwardly from the bars. In the drawings these feed bars are shown without operating connections, but it may be understood that whether as a part of the feeding machine shown or as a part of the machine which is to be served by the feeding machine, they are connected with means for reciprocating them synchronously with the action of the valve, 21, which causes the operation of the lifting devices by means of the piston, 11; and that these reciprocating means are timed so as to thrust the bars, 25, back above the top of the pile of blanks—that is, above the upper edge of the forward post, 6, against which the pile of blanks is stopped and by which it is gaged—after the lifting action has proceeded far enough to separate the top blank from the pile at the ends and lifts it high enough for the bars, 25, to enter under it at the ends above the remainder of the pile. If the bars enter under the ends of the blank before it is lifted more than barely enough to permit them to thus enter, the ratchet dogs, 26, colliding with the forward edge of the blank will be forced downward and will slide under the blank and spring up to engage behind its rear edge ready to feed it onward upon the reverse movement of the feed bars. To permit the blank to lie flat upon the bars and in that condition to be fed forward thereby, the suckers or suction mouths, 17, must be released from the blank at the ends of the latter so that it may straighten out on the feed bars, 25; and in any case, it will be best to release it rather than to detach it by edgewise movement from the sucker mouths. For such release, there is provided in the tubular piston stem which connects the source of rarefied air with the sucker mouths, the valve, 27, which is held normally in position affording communication through the piston stem with the sucker mouths and which is adapted to be moved to cut off such communication and admit atmospheric air to the passage beyond it leading to the sucker mouths. The stem of this valve has a lever arm, 28, projecting rearward, and for operating it to shift it to position for venting and releasing the sucker mouths there is mounted on a hanger arm, 29, which is attached to the cross head, 9, a lever, 30, connected by a link, 31, with a lever arm, 32, of a rock shaft, 33, which is journaled at the lower end of the same hanger arm, said rock shaft having a lever arm, 34, which protrudes downward in position to be encountered by one of the bars, 25, during the rearward stroke of said bar for passing under the lifted end of the blank. The parts are relatively proportioned and adjusted so that this collision occurs and operates the rock shaft for causing the lever arm, 30, to open the valve, 27, at the limit of the rearward stroke of the reciprocating bars, 25, when the dogs, 26, have passed beyond the rear edge of the blank so that they may engage it. The sucker being released from the blank by the opening of the valve, the blank reacts into its normal straight form, lying across the bars, 25, in front of the ratchet dogs, and is carried out by the next forward movement of said bars.

I claim:—

1. In a machine for the purpose indicated, a support for a pile of blanks; means pressing upon the exposed blank of the pile between two opposite edges thereof to restrain such blank from being lifted; devices for engaging the exposed surface of said blank at opposite sides of said restraining means; means for moving the engaging devices for lifting said blank at the engaged parts, and means entering between the lifted parts of the said blank and the next blank of the pile for maintaining separation between them.

2. In a machine for the purpose indicated, a support for the blanks; a suction device for lifting the opposite lateral edges of the blank; means for restraining the blank from being lifted between said edges, and blank-feeding means entering under the lifted lateral edges of the blank at the forward edge adapted to engage the blank for feeding at the rear edge.

3. In a machine for the purpose indicated, in combination with a support for a pile of blanks, pneumatic devices comprising two suckers for engaging the exposed blank of the pile at two separated positions; means for lifting said suckers to detach the blank from the pile; a device entering under the detached blank for separating it from the pile; a valve for venting both the suckers, and connections for opening the valve operated by said separating device.

4. In a machine for the purpose indicated, in combination with a support for a pile of blanks, a device adapted to be advanced against the exposed blank of the pile comprising an elastically yielding presser and two suckers at opposite sides of the presser, the presser being protruded relatively to the suckers so as to encounter the blank before

the latter; means for advancing the entire device for such encounter and for retracting it after the suckers encounter the blank.

5. In a machine for the purpose indicated, in combination with a support for a pile of blanks, a device comprising an elastically yielding presser and a sucker adapted to encounter the surface of the exposed blank of the pile; a cylinder having communication with a source of rarefied air for suction; a piston in the cylinder operatively connected with said device for moving the latter for encounter of the presser and sucker with the blank by movement of the piston in one direction and for retracting it upon the reverse movement of the piston, the piston stem constituting a duct for communication of the rarefied air past the piston with the sucker; means for cutting off the rarefied air and venting the passage to the cylinder to permit the piston to move in the direction for such encounter and for re-opening such communication to retract the piston after the sucker encounters the blank.

6. In a machine for the purpose indicated, in combination with a support for a pile of blanks, a cylinder having communication with a source of rarefied air for suction; a valve which controls such communication; a piston in the cylinder adapted to be retracted thereinto upon opening communication with the rarefied air; a device connected with the piston and normally operating by gravity to withdraw the piston, said device comprising an elastically yielding presser and a sucker which are advanced by gravity against the exposed blank of the pile, the presser being protruded relatively to the sucker to encounter the blank first, the piston stem constituting a duct by which the sucker communicates past the piston with the cylinder cavity; means for periodically operating the valve to cut off the rarefied air and re-opening the same after the piston moves outward in the cylinder and the sucker has encountered the blank.

7. In a machine for the purpose indicated, in combination with a support for blanks, adapted to be advanced in the direction of the thickness of the blanks; a device adapted to be moved to encounter the surface of the exposed blank comprising an elastically yielding presser and a sucker, said device comprising a piston and a cylinder in which it operates, the piston stem being hollow and affording communication from the cylinder beyond the piston with the sucker, the cylinder having communication with a source of rarefied air, the presser being protruded relatively to the sucker for encountering the blank before the latter; a valve which controls the rarefied air communication of the cylinder, and means for operating it periodically for opening such communication and for venting the cylinder.

8. In a machine for the purpose indicated, in combination with a support for blanks, adapted to be advanced in the direction of the thickness of the blanks; a device adapted to be advanced against the exposed blank comprising an elastically yielding presser and two suckers at opposite sides of the presser, the presser being protruded relatively to the suckers to encounter the blank in advance of the latter; a cylinder having communication with a source of rarefied air; a valve controlling such communication; a piston in the cylinder, the piston stem being hollow and connected with said device and affording communication from the cylinder beyond the piston to the suckers, said communication having a vent to the atmosphere, and a valve which controls said vent, said valve being normally closed, and means for opening it after the piston is retracted in the cylinder.

9. In a machine for the purpose indicated, in combination with a support for a pile of blanks, a device for separating the top blank from the pile comprising an elastically yielding presser and two suckers at opposite sides of the presser; a piston connected with said device; a cylinder into which the piston may be retracted, said cylinder having communication with a source of rarefied air for so retracting it, the suckers being also connected with said source; a valve controlling said communication and for venting the cylinder back of the piston; means for operating said valve to cut off communication with the rarefied air and open the vent to permit the piston to move outward in the cylinder and for reversing the valve to retract the piston; a vent in the communication of the rarefied air with the suckers, and a valve for controlling said vent adapted to be normally closed, and means for opening said last-named valve to vent the suckers when the first valve is opened for communication of the cylinder with the rarefied air.

10. In a machine for the purpose indicated, in combination with a support for a pile of blanks; two suckers adapted to engage the surface of the exposed blank; a tubular support for carrying said suckers having communication with the source of rarefied air for operating the suckers; an elastically yielding sucker carried by said sucker-support between the two suckers and protruded relatively to the suckers to encounter the blank before the latter; means for advancing the suckers and presser against the exposed blank and for retracting them; a valve for controlling the communication of rarefied air with the suckers and means for operating it to open such communication while the suckers are pressed against the

blank; a valve for venting the suckers and means for opening it after the suckers are retracted for lifting the blank.

11. In a machine for the purpose indicated, in combination with a support for a pile of blanks, pneumatic devices for engaging the exposed blank of the pile by suction; means for lifting said device to detach said blank from the pile; means entering under the detached blank to separate it from the pile; a valve for venting the pneumatic devices to relieve the suction and release the blank and connections for operating said valve operated by said separating devices.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 27th day of October, A. D., 1905.

EMIL TYDEN.

Witnesses:
CHAS. S. BURTON,
HOMER KRAFT.