



No. 682,189.

S. T. GREEN.

Patented Sept. 10, 1901.

MANUFACTURE OF FLOUR.

(Application filed May 5, 1900.)

(No Model.)

5 Sheets—Sheet 2.

Fig. 5.

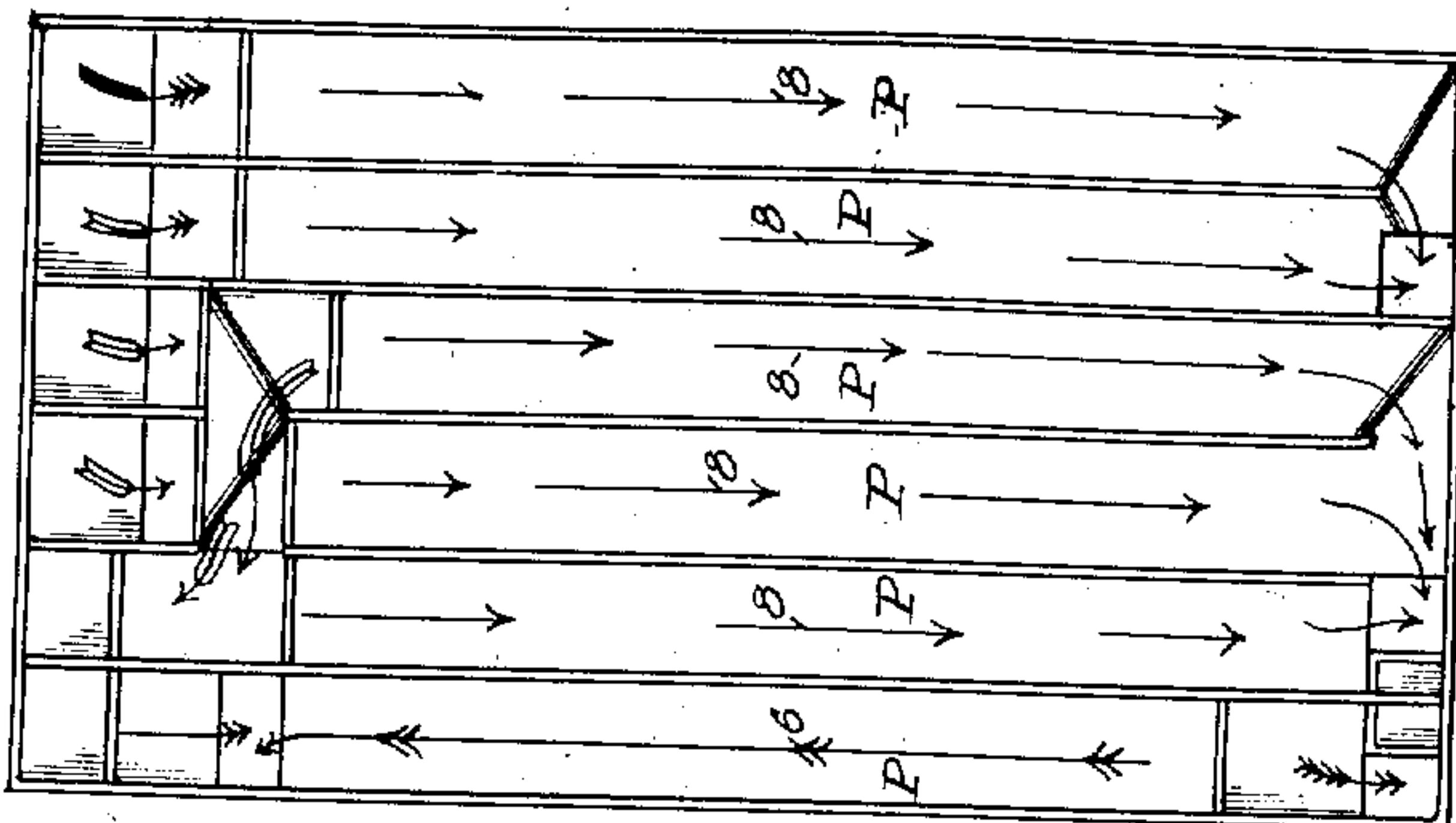


Fig. 4.

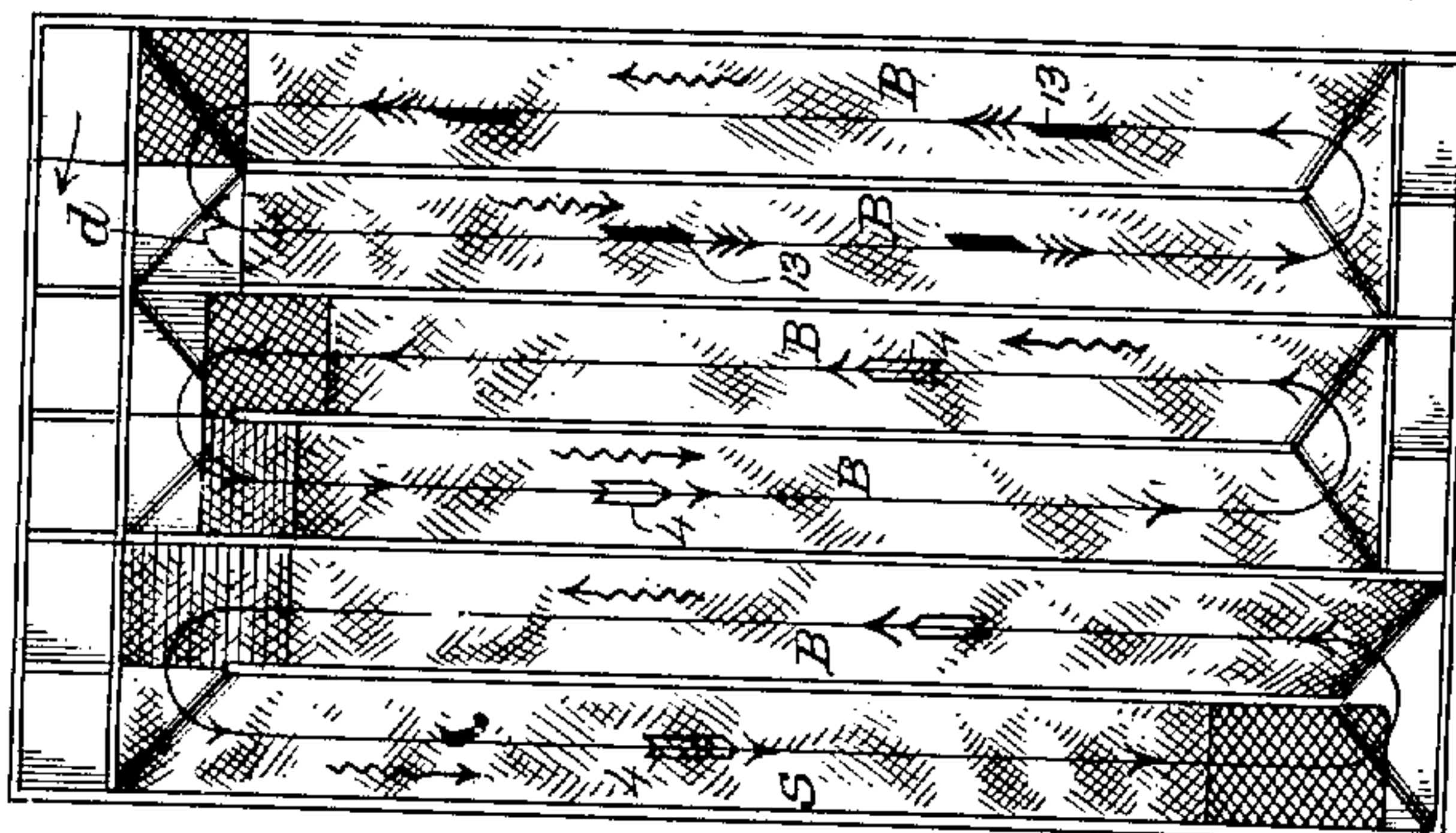


Fig. 3.

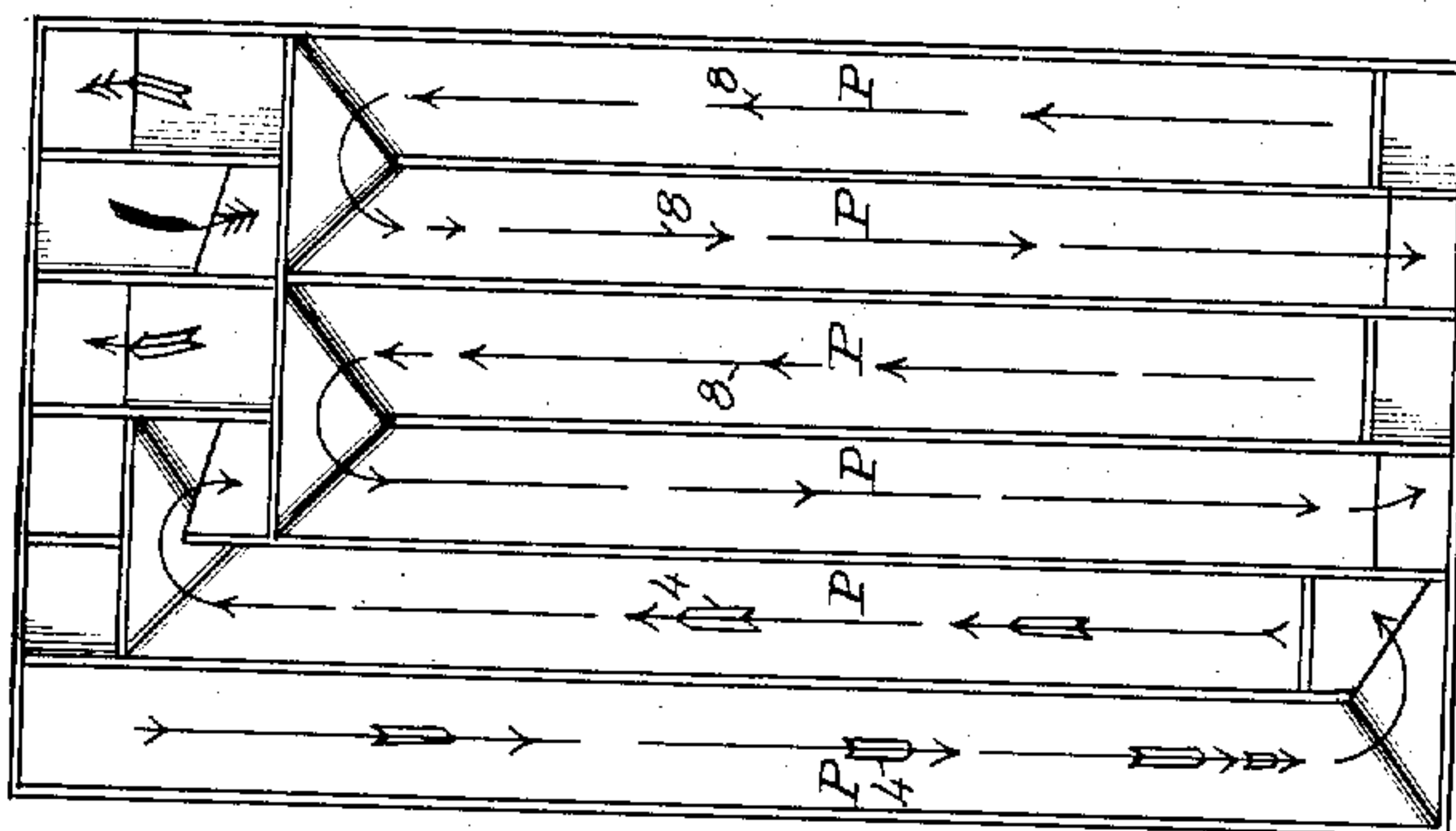
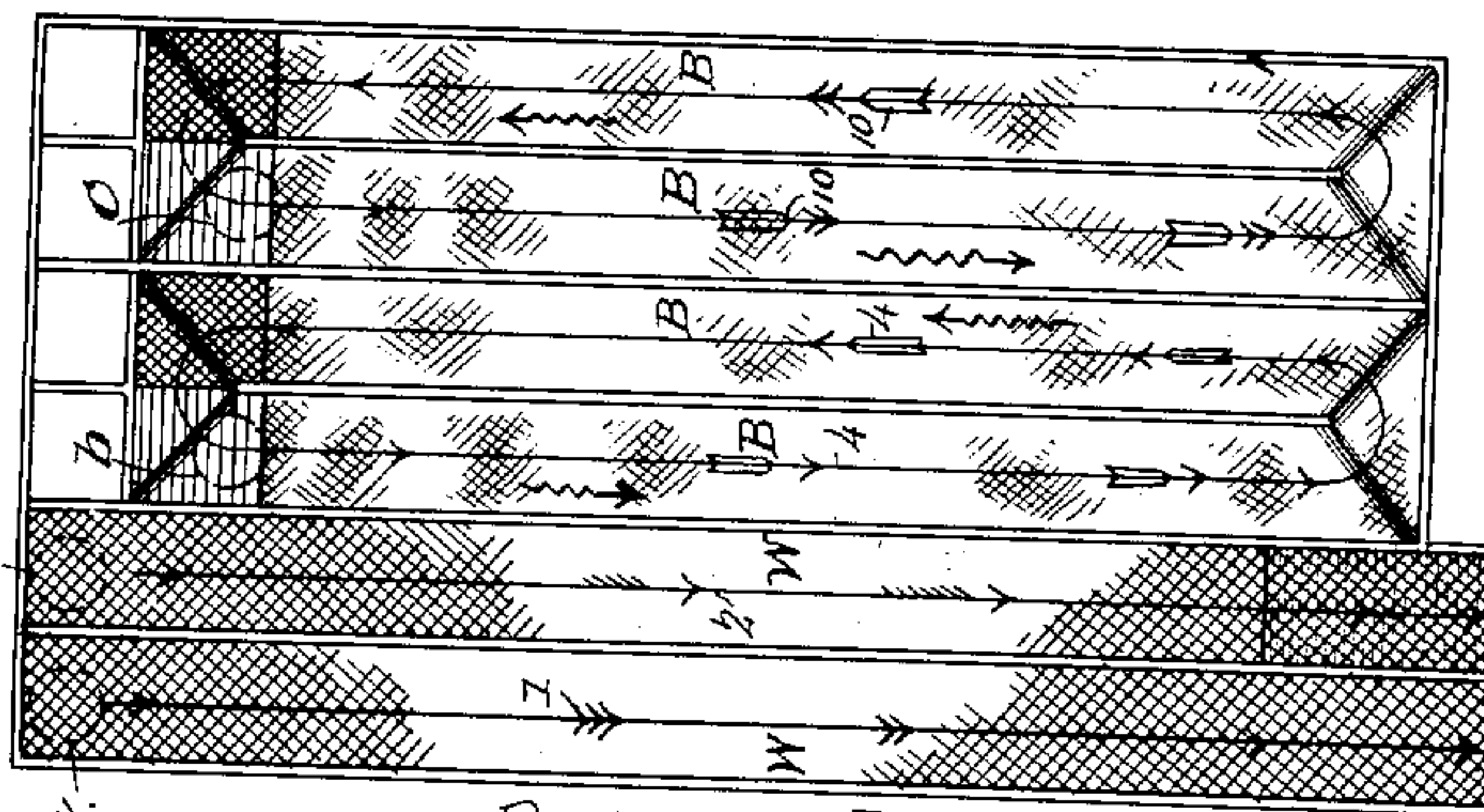


Fig. 2.  
2 Break.



Witnesses

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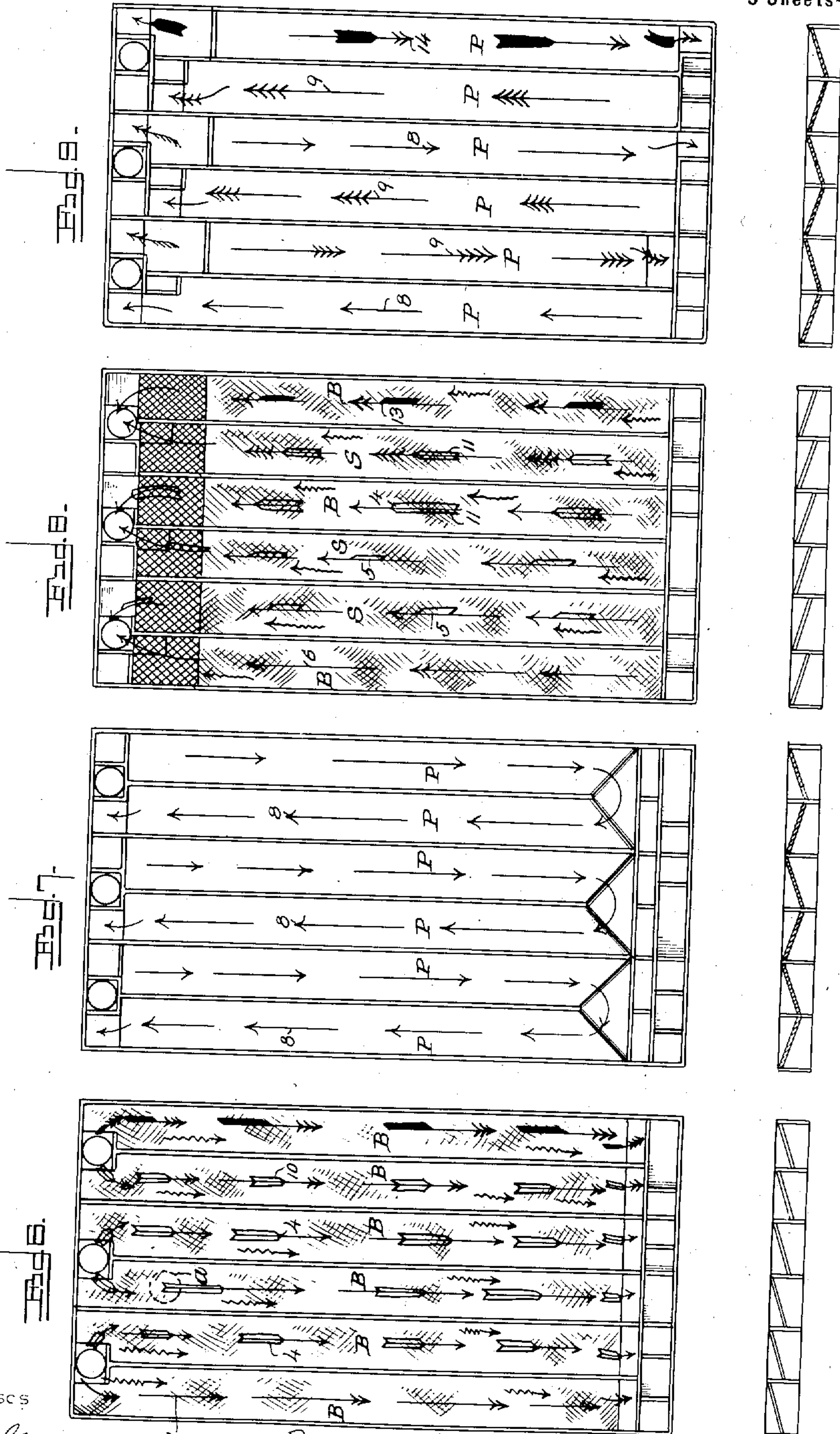
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5 Sheets—Sheet 3.



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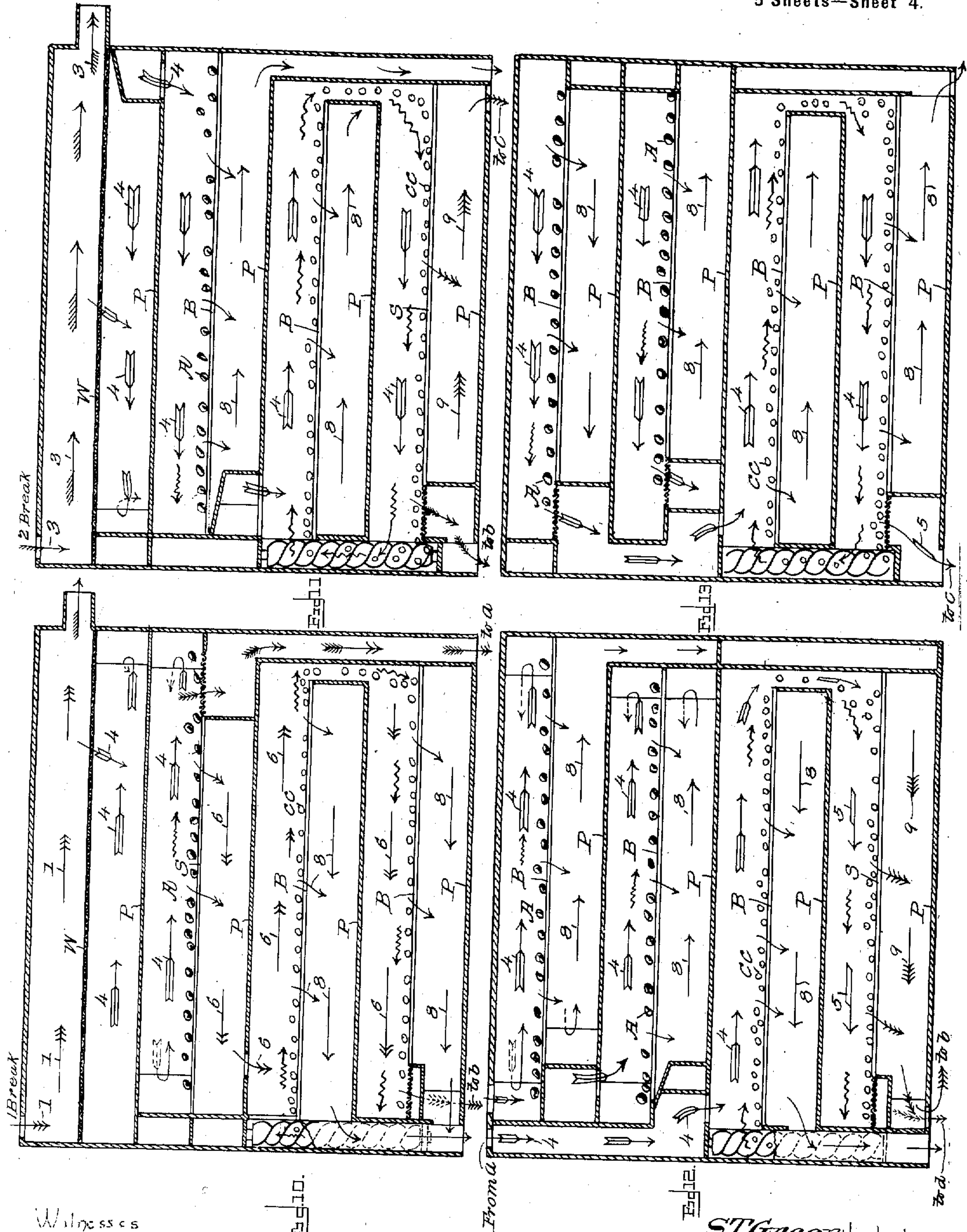
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(No Model.)

5 Sheets—Sheet 4.



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No. 682,189.

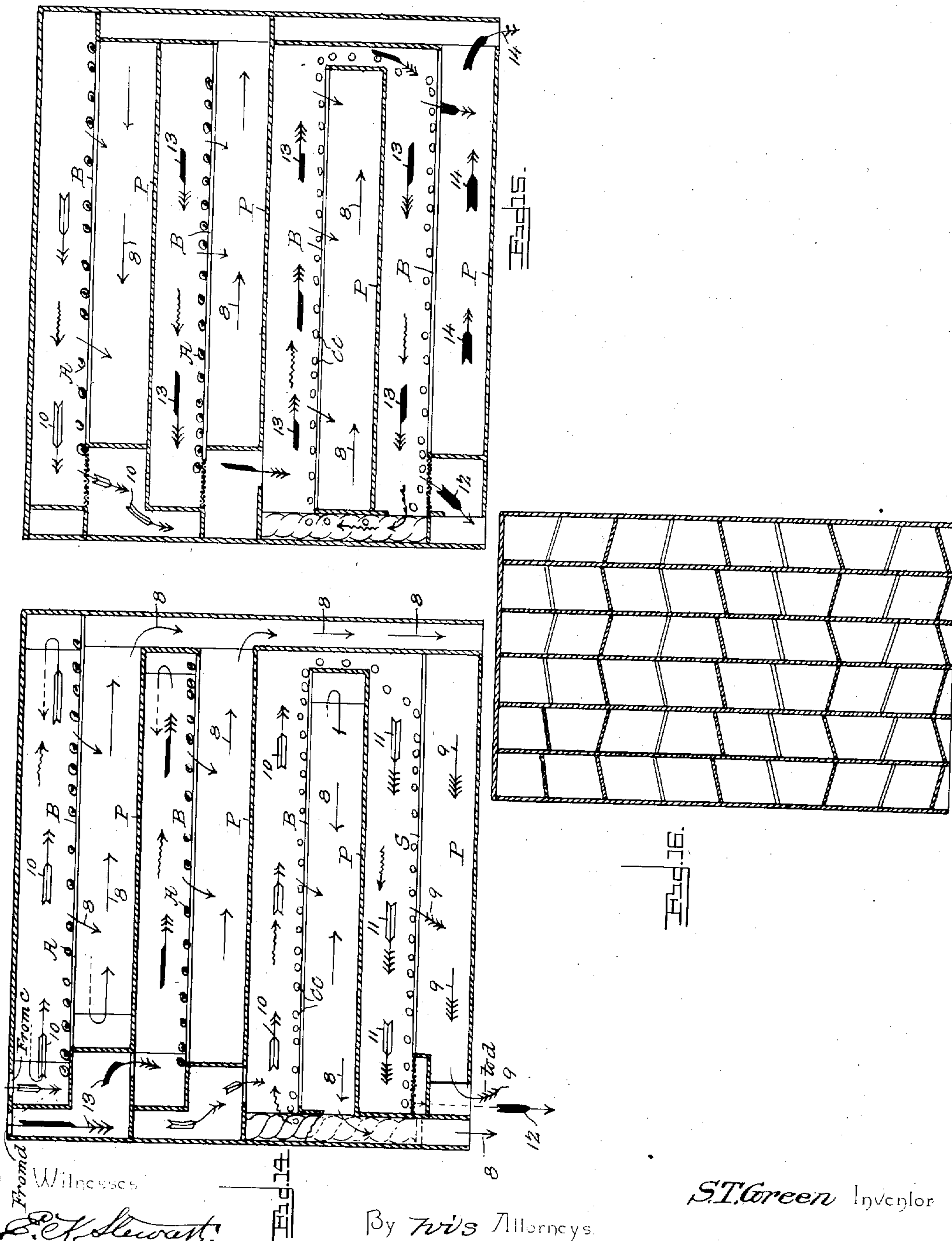
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(Application filed May 5, 1900.)

(No Model.)

5 Sheets—Sheet 5.



From  
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# UNITED STATES PATENT OFFICE.

SQUIRE THOMAS GREEN, OF BEESPRING, KENTUCKY.

## MANUFACTURE OF FLOUR.

SPECIFICATION forming part of Letters Patent No. 682,189, dated September 10, 1901.

Application filed May 5, 1900. Serial No. 15,601. (No model.)

*To all whom it may concern:*

Be it known that I, SQUIRE THOMAS GREEN, a citizen of the United States, residing at Beespring, in the county of Edmonson and State of Kentucky, have invented a new and useful Improvement in the Manufacture of Flour, of which the following is a specification.

My invention is an improvement in the manufacture of flour, its objects being to prevent the choking of the sifter, to effect a material economy in the work of reducing the stock, and to enhance the quality of the flour obtained; and it consists, essentially, in the method hereinafter set forth in the description in connection with the drawings, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a diagrammatic vertical section of a mill adapted for making flour in accordance with my improved process. Fig. 2 is a horizontal diagrammatic sectional view through the sifter on a plane above the first vertical section therein. Fig. 3 is a similar view of the same on a plane intersecting the second vertical section. Fig. 4 is a similar view of the same on a plane intersecting the third vertical section. Fig. 5 is a similar view of the same on a plane intersecting the fourth vertical section. Fig. 6 is a similar view of the same on a plane intersecting the fifth vertical section. Fig. 7 is a similar view of the same on a plane intersecting the sixth vertical section. Fig. 8 is a similar view of the same on a plane intersecting the seventh vertical section. Fig. 9 is a similar view of the same on a plane intersecting the eighth vertical section. Fig. 10 is a vertical sectional view on a plane through the first break-section of the sifter. Fig. 11 is a similar view on a plane intersecting the second break-section of the sifter. Fig. 12 is a similar view on a plane intersecting the *a* break-section of the sifter. Fig. 13 is a similar view on a plane intersecting the *b* break-section of the sifter. Fig. 14 is a similar view on a plane intersecting the *c* break-section of the sifter. Fig. 15 is a similar view on the plane intersecting the *d* break-section of the sifter. Fig. 16 is a diagrammatic vertical transverse sectional view of the sifter.

In the specification I have numbered the

vertical sections of the sifter from "1" up, consecutively, beginning at the top, and have referred to the various vertical series of sections of the sifters as first break, second break, and so on, using corresponding terms when referring to the sets of reducing-rolls.

For the purposes of illustration I have indicated diagrammatically the usual series of break-rolls constituting the first break, second break, *a* break, *b* break, *c* break, and *d* break corresponding with the vertical break-sections of the sifter, said break-rolls being represented in Fig. 1, and in the said figure the courses of the material through the various break-rolls and various sections of the sifter have been traced, and throughout the drawings the various material and admixtures of material have been represented symbolically by arrows, thus: The triple-headed arrow 1 represents wheat or grain. The single-headed arrow 2, with a feathered shaft, represents an admixture of bran, flour, and middlings. The double-headed arrow 3, with a feathered shaft, represents bran. The single-headed arrow 4, with an open flag on both sides of its shaft, represents an admixture of coarse and fine middlings and flour. The single-headed arrow 5, with an open flag on one side of its shaft, represents an admixture of coarse and fine middlings. The double-headed arrow 6, with an unfeathered shaft, represents an admixture of fine middlings and flour. The double-headed arrow 7, with a feathered shaft, represents coarse middlings. The single-headed arrow 8, with an unfeathered shaft, represents flour. The four-headed arrow 9, with an unfeathered shaft, represents fine middlings. The double-headed arrow 10, with open flags on both sides of the shaft, represents an admixture of fine middlings, feed or ship-stuff, and flour. The four-headed arrow 11, with an open flag on each side of its shaft, represents an admixture of fine middlings and feed or ship-stuff. The single-headed arrow 12, with a black flag on each side of its shaft, represents feed or ship-stuff. The triple-headed arrow 13, with a black flag on one side of its shaft, represents an admixture of feed or ship-stuff and flour. The double-headed arrow 14, with a black flag on each side of its shaft, represents low-grade flour.

Through the various figures of the draw-



ings, W represents wire screens, P represents paper or other imperforate bottoms of the various screen-sections, S represents separator-cloths, and B represents bolting-cloths.

5 In the making of flour by my improved method I also employ independent cleaners, represented at A, and circulating cleaners, represented at C C.

10 In my improved process the wheat is passed through the first break of rolls, by which it is partially crushed, and is fed onto the wire screen in the first vertical section of the first break of the sifter, which wire screen separates the bran from the material, the bran  
15 being discharged from one end of the said wire screen and is conveyed therefrom to the second break of rolls. The coarse and fine middlings and flour resulting from this initial grinding or breaking of the wheat pass  
20 through the said wire screen of the said first vertical section of the said first break of the sifter and drop upon the imperforate bottom P of the second vertical section of the said first break of the sifter and pass there-  
25 from to the bolting-cloths in the bottom of the third vertical section of the second break of the sifter. As the said admixture of coarse and fine middlings and flour passes over the said bolting-cloth the finest flour is bolted  
30 from the said admixture and passes through the said bolting-cloth and falls upon the imperforate or paper bottom of the fourth vertical section of the second break of the sifter and passes therefrom as a finished product  
35 of first-grade flour, which is never afterward reground or re-treated in any manner. The fine and coarse middlings pass from the said bolting-cloth in the bottom of the said third section of the said second break of  
40 the sifter onto the separating-cloth in the bottom of the third vertical section of the first break of the sifter. Independent cleaners are used on the said bolting-cloths and separating-cloth, the said independent cleaners circulating or traveling lengthwise upon  
45 said bolting-cloth and separating-cloth and from one to the other, owing to the motion of the sifter, which is communicated thereto in the manner well known to millers and others skilled in the art. The said separating-cloth,  
50 which forms the bottom of the said third section of the first break of the sifter, serves to separate the coarse middlings from the fine middlings, the coarse middlings passing from  
55 the said separating-cloth and being conveyed to the a break of the rolls and reground thereby, while the fine middlings, which contain a larger proportion of flour in admixture therewith and which has escaped the bolting-  
60 cloth by reason of its not being sufficiently fine to pass through the said bolting-cloth, are subsequently treated as hereinafter described.

65 Heretofore in milling processes the coarse middlings have been first separated from the fine middlings and finest flour and the finest flour subsequently bolted from the fine mid-

dlings; but this method is objectionable on account of the tendency of the material to choke the bolting-cloth, owing to the large  
70 proportion of the flour in the fine middlings, this being especially true when the grain is damp. I obviate this objection, as hereinbefore indicated, by my improved method, wherein I first bolt the finest flour from the  
75 middlings, while the fine and coarse middlings are admixed therewith, thus greatly reducing the proportion of the flour in the middlings, and subsequently separate the  
80 coarse middlings from the fine middlings, so that the proportion of the flour in the fine middlings is so greatly reduced that there is no tendency of the same to clog the bolting-  
85 cloth in the subsequent stages in the process of making the flour. The fine middlings and flour which pass through the said separating-  
90 cloth in the bottom of the third section of the first break of the sifter fall upon the imperforate bottom of the fourth vertical section of the first break of the sifter, pass over  
95 the same to one end thereof, and fall through an opening onto the bolting-cloth, which forms the bottom of the fifth vertical section of the first break of the sifter, a proportion  
100 of the flour passing through the said bolting-cloth and falling upon the imperforate bottom of the sixth vertical section of the first break of the sifter and being discharged therefrom and constituting flour of  
105 the second grade. The middlings and flour which fail to pass through the said bolting-cloth which forms the bottom of the fifth vertical section of the first break of the sifter  
110 fall, together with a system of circulating cleaners, bodily from one end of the said bolting-cloth onto a bolting-cloth which forms the bottom of the seventh vertical section of  
115 the first break of the sifter, and by thus dropping the said admixture of fine middlings and flour bodily from one bolting-cloth to a lower  
120 bolting-cloth, together with a system or number of cleaners, the masses of said material are mechanically broken up, and any tendency thereof to cake together and choke the  
125 bolting-cloths is obviated, this being a matter of very serious consequence, as will be readily understood by millers and others skilled in this art.

I am aware that it has been heretofore proposed to drop the screenings from a bolting-  
120 cloth bodily onto a lower bolting-cloth, and this, broadly, I disclaim. I am also aware that it has been heretofore proposed to subject material on a bolting-cloth to the action  
125 of a system or number of cleaners, and this also, broadly, I disclaim; but my method of preventing the material from caking and choking the bolting-cloths hereinbefore described, consisting in dropping the screenings  
130 bodily from a bolting-cloth to a lower bolting-cloth, together with a system or number of circulating cleaners, is novel and constitutes an important feature of my improvement. The flour which passes through the said bolt-



ing-cloth, which forms the bottom of the seventh vertical section of the first break of the sifter, is third-grade flour, and it falls upon the imperforate bottom of the eighth vertical section of the first break of the sifter and is discharged therefrom as a finished product. The fine middlings or screenings of the said bolting-cloth, which forms the bottom of the said seventh vertical section of the first break of the sifter, is conveyed to the *b* break of rolls. At this stage of the process of making flour, as hereinbefore described, the wheat after having been partially ground by the first break of rolls has been separated into three grades of flour, bran, coarse middlings, and fine middlings and the bran conveyed to the second break of rolls, the coarse middlings conveyed to the *a* break of rolls, and the fine middlings conveyed to the *b* break of rolls. The bran is ground by the second break of rolls and conveyed to the wire screen forming the bottom of the first vertical section of the second break of the sifter. As the same passes over the said wire screen the coarse and fine middlings and flour are separated therefrom, the bran being discharged from said wire screen to the bran-duster and the coarse and fine middlings and flour separated from the bran falling upon the imperforate bottom of the second vertical section of the second break of the sifter, passing therefrom onto the bolting-cloth forming the bottom of the third vertical section of the *a* break and *b* break of the sifter and caused to pass over said bolting-cloth, together with independent cleaners thereon. The flour which passes through the bolting-cloth forming the bottom of the third vertical section of the *a* break of the sifter is fourth-grade flour and falls upon and is discharged from the imperforate bottom of the fourth vertical section of the *a* break of the sifter, and the flour which passes through the bolting-cloth forming the bottom of the third vertical section of the *b* break of the sifter is flour of the fifth grade and falls upon and is discharged from the imperforate bottom of the fourth vertical section of the *b* break of the sifter. The screenings, fine and coarse middlings, and flour of said bolting-cloth pass to the bolting-cloth forming the bottom of the fifth vertical section of the second break of the sifter and pass over said bolting-cloth, the flour which passes through the same being flour of the sixth grade, while the stock, which fails to pass through the said bolting-cloth—to wit, fine and coarse middlings—passes to a separating-cloth forming the bottom of the seventh vertical section of the second break of the sifter, which separating-cloth, together with circulating cleaners, as hereinbefore described, separates the fine middlings from the coarse middlings, the coarse middlings passing from the said separating-cloth to a valve, which is adapted to establish communication either with the *b* or *c* break of rolls. The fine middlings which pass through the said separating-cloth are

conveyed to the *c* break of the rolls. In the event that the stock is damp the coarse middlings resulting from the second separation is by the valve caused to be fed to the *b* break of rolls. The *b* break of rolls are finer at one end than at the other. In other words, they more closely approach each other at one end than at the other. The fine middlings resulting from the first separation are fed to the fine end of the said *b* break of rolls, while the coarse middlings of the damp stock resulting from the second separation are fed to the coarse end of the said *b* break of rolls, the said fine middlings and coarse middlings commingling after passing through the said set of rolls, and the resulting stock containing a portion of flour is conveyed from the said *b* break of rolls to the first vertical section of the *a* break of the sifter, where it falls upon the bolting-cloth-forming the bottom of the said section. The flour which passes through the said bolting-cloth falls upon the imperforate bottom of the second vertical section of the *a* break of the sifter and is discharged therefrom and is flour of the eighth grade. Such stock as fails to pass through the said bolting-cloth passes, together with independent cleaners, onto the bolting-cloth forming the bottom of the first section of the *b* break of the sifter, and such flour that passes through the said latter bolting-cloth is flour of the ninth grade and falls upon the imperforate bottom of the second section of the *b* break of the sifter and is discharged therefrom. The coarse and fine middlings forming the screenings of the said latter bolting-cloth drop therefrom onto a bolting-cloth forming the bottom of the fifth vertical section of the *b* break of the sifter. Such flour as passes through the said bolting-cloth is flour of the tenth grade and falls upon the imperforate bottom of the sixth vertical section of the *b* break of the sifter and is discharged therefrom. The screenings, fine and coarse middlings, and flour of the said bolting-cloth drop from one end thereof, together with circulating cleaners, onto the bolting-cloth forming the bottom of the seventh vertical section of the *b* break of the sifter in the manner hereinbefore described, and in passing over said bolting-cloth such of the stock as passes through said bolting-cloth is flour of the eleventh grade and falls upon the imperforate bottom of the eighth vertical section of the *b* break of the sifter and is discharged therefrom. The screenings and fine and coarse middlings of the said bolting-cloth are conveyed to the *c* break of rolls and ground at the coarse end of the said *c* break of rolls.

The coarse middlings resulting from the first separation hereinbefore described and conveyed to the *a* break of rolls after being ground by said *a* break of rolls are conveyed to the fifth vertical section of the *a* break of the sifter and treated on the bolting-cloth forming the bottom of said section, such material as passes through said bolting-cloth be-



ing flour of the seventh grade, and the screenings and fine and coarse middlings from said bolting-cloth dropping from one end thereof, together with circulating cleaners in the manner hereinbefore described, onto a separating-cloth which forms the bottom of the seventh vertical section of the *a* break of rolls. The coarse middlings resulting from said separation are conveyed to *d* break-rolls, while the fine middlings resulting from said separation are conveyed to *b* break-rolls.

By causing the coarse middlings to be mixed with the fine stock which passes from the *b* break of rolls when the stock is damp, in the manner hereinbefore described, the said coarse middlings prevent the said stock from caking and choking the bolting-cloth by which it is subsequently treated, and by this method of commingling coarse middlings with damp stock before the same is bolted I effectually prevent the same from choking in the sifter.

I am aware that it has been heretofore proposed to prevent stock from choking the sifter by commingling bran with the stock before the same is bolted. This differs from my method, in this that I employ coarse middlings admixed with the stock before bolting to prevent the choking of the sifter and subsequently reduce the screenings resulting from the said bolting, while in the process above referred to, wherein it is proposed to pass bran with the stock over the bolting-cloth, the bran is so much dead material, which has no other effect than the mechanical one of preventing the choking of the sifter, and inasmuch as a considerable proportion of said bran has to be employed for this purpose the capacity of the sifter, and hence the output of the mill, is greatly reduced. My process differs from this in that I employ the coarse middlings for the purpose of preventing the choking of the sifter and after the stock has been bolted reduce the middlings by a subsequent grinding to produce more flour therefrom, and hence the middlings which pass together with the finer ground stock through the sifter by my process of milling is material which is afterward reduced to flour and is not foreign thereto, as is the case of the bran before referred to, and I obviate the disadvantage of reducing the capacity of the sifter, which is an objection to the use of the bran.

In the event that the stock is dry no advantage would result from an admixture of coarse middlings therewith, and hence, assuming that the stock is dry, I adjust the valve in such manner as to cut off the supply of coarse middlings to the *b* break of rolls and cause the said coarse middlings to be fed to the *c* break of rolls, together with the fine middlings resulting from the second separation, and the tailings or fine middlings separated from the eleventh grade of flour, as hereinbefore described. The coarse middlings are fed to the coarse end of the said *c* break of rolls, and the fine middlings are fed to the fine end thereof, and the stock (fine

middlings, feed, and flour in admixture) resulting from the grinding by the said *c* break of rolls is conveyed to the bolting-cloth forming the bottom of the first section of the *c* break of the sifter. The material which passes through said bolting-cloth is flour of the twelfth grade and falls upon the imperforate bottom of the second section of the *c* break of the sifter and is discharged therefrom, while such material as fails to pass through said bolting-cloth passes onto the bolting-cloth forming the bottom of the first section of the *d* break of the sifter, such material as passes through said latter bolting-cloth being flour of the thirteenth grade and falling upon and being discharged from the imperforate bottom of the second section of the *d* break of the sifter. It will be understood from the drawings that the material on the said bolting-cloths of said vertical section of *c* and *d* breaks of the sifter is subjected to the action of independent cleaners on said bolting-cloths in the manner hereinbefore described. The tailings or screenings from the bolting-cloth of the first section of the *d* break of the sifter are conveyed to the bolting-cloth forming the bottom of the fifth vertical section of the *c* break of the sifter, such material as passes through said latter bolting-cloth being flour of the fourteenth grade and falls upon the imperforate bottom of the sixth vertical section of the *c* break of the sifter and is discharged therefrom as a finished product. The tailings from the said latter bolting-cloth fall through an opening at one end thereof in connection with a system of circulating cleaners in the manner hereinbefore described onto a separating-cloth forming the bottom of the seventh vertical section of the *c* break of the sifter and are thereby separated into fine middlings and feed, the fine middlings passing through the said separating-cloth and being conveyed to the *d* break of the rolls, while the feed or ship-stuff is conveyed to the feed-bin. The fine middlings resulting from the last or fourth separation above described are fed to the fine end of the *d* break of rolls, and the coarse middlings resulting from the third separation hereinbefore described are fed to the coarse end of the said break of rolls, and the stock resulting from the regrinding by said *d* break of rolls is conveyed to the bolting-cloth forming the bottom of the third vertical section of the *c* break of the sifter, such material as passes through said bolting-cloth being flour of the fifteenth grade and falls upon the imperforate bottom of the fourth vertical section of the *c* break of the sifter and is discharged therefrom as a finished product. Such of the stock as fails to pass through said last-mentioned bolting-cloth passes onto the bolting-cloth forming the bottom of the third vertical section of the *d* break of the sifter, such material as passes through said last-mentioned bolting-cloth being flour of the sixteenth grade and falls upon the imperforate bottom of the fourth vertical



section of the *d* break of the sifter and is discharged therefrom as a finished product.

It will be understood that a system of independent cleaners are employed on the bolting-cloths last above mentioned forming the bottoms of the third vertical sections of the *c* and *d* breaks of the sifter.

The tailings from the bolting-cloth forming the bottom of the third vertical section of the *d* break of the sifter are conveyed therefrom to the bolting-cloth forming the bottom of the fifth vertical section of the *d* break of the sifter. Such material as passes through said last-mentioned bolting-cloth is flour of the seventeenth grade and falls upon the imperforate bottom of the sixth vertical section of the *d* break of the sifter and is discharged therefrom as a finished product.

The tailings from the last above-mentioned bolting-cloth containing feed or ship-stuff and low-grade flour are discharged through an opening at one end of said bolting-cloth in connection with a system of circulating cleaners and fall upon the bolting-cloth forming the bottom of the seventh vertical section of the *d* break of the sifter and are bolted thereby. The low-grade flour, which passes through said bolting-cloth and falls upon the imperforate bottom of the eighth vertical section of the *d* break of the sifter, is discharged therefrom as a finished product and conveyed to the low-grade-flour bin, while the feed or ship-stuff which fails to pass through said last-mentioned bolting-cloth is conveyed to the feed-bin, which also receives the feed or ship-stuff resulting from the fourth separation hereinbefore described.

The bran which was conveyed to the bran-duster from the first section of the second break of the sifter, as hereinbefore described, contains a certain proportion of flour and feed, which is taken therefrom by the bran-duster in the manner well known by millers and others skilled in the art, the bran being conveyed therefrom to the bran-bin, and the flour and feed being conveyed either to the stock from the *d* break of rolls or to the stock of the *c* break of rolls and is subsequently treated therewith in a manner hereinbefore described.

It will be understood that the stock in passing through the sifter is successively mixed with and separated from various systems of cleaners, which systems are independent of each other and do not become commingled, and thereby the stock is prevented from choking the bolts, and it will be further understood that the flour resulting from each bolting is immediately taken from the stock in circulation through the sifter and discharged as a finished product and not reground. Hence successively after each bolting of the flour the volume of the stock undergoing the sifting process is reduced proportionately as new stock is supplied to the sifter from the first break of the rolls and the flow or passage

of the stock through the sifter is evenly maintained.

In practice I employ, say, six grains of whole wheat as cleaners to the square inch of the first bolting-cloth and reduce this number of cleaners to four or less per square inch on the other bolting-cloths. I thus vary the quantity or number of the cleaners employed on the various bolting-cloths according to the volume of the stock to be treated by said bolting-cloths, and this I am enabled to do by employing separate systems of cleaners in connection with the various bolts, as hereinbefore described. It should be further observed and understood that the first bolting of flour from the stock occurs in an initial stage of the sifting process, where the volume of the stock is greatest, and is accomplished partly through the agency of an independent system of cleaners. It should be further understood that after each bolting and taking of flour from the stock the stock is further reduced by being passed through another set of rolls and conveyed to an appropriate bolt of the sifter according to its grade, the process being repeated as many times as may prove desirable. By thus taking out the finished flour resulting from each grinding before subjecting the stock to a subsequent reduction I greatly enhance the efficiency and increase the capacity of the sifter, so that I by my improved process of milling am enabled to effect a material economy in the manufacture of flour by reducing the number of sets of rolls required by a given output of product. By taking out flour after each bolting in accordance with my improved process, as hereinbefore described, not only is the capacity of the sifter, and hence the capacity of the mill, greatly increased, but the flour produced is of better quality than that which is reground, as is now the practice in roller-mills. The flour by my process is only ground once, although the stock passes through a series of sets of breaks of rolls, while in existing processes heretofore employed in roller-mills the flour is repeatedly reground, greatly to the detriment thereof. Moreover, by my improved process, wherein I subject the stock to a series of partial reductions and take out the flour resulting from each partial reduction, the stock by being thus treated yields an increased proportion of flour, as will be readily understood. In practice by the use of my said improved method of milling hereinbefore described I have increased the capacity of a mill employing six sets of rolls from forty barrels of flour per day to sixty barrels of flour per day.

The various grades of flour produced by my improved process may be either conveyed to separate bins and placed upon the market as different brands of flour, there being a slight difference in quality between each grade of flour and that which is obtained at a subsequent partial reduction of the stock, or the



various grades of flour may be blended or any number of said grades may be blended, as may be desired.

Having thus described my invention, I  
5 claim—

1. The herein-described flouring process consisting in partially grinding the wheat, screening the bran therefrom, bolting the finest flour from the resulting stock, separating the coarse middlings from said stock, bolting the finished flour from the fine middlings, and subsequently separately reducing  
10 said coarse and fine middlings.

2. The herein-described flouring process  
15 consisting in partially grinding the wheat,

screening the bran therefrom, bolting the finest flour from the resulting stock, separating the coarse middlings from said stock, bolting the finished flour from the fine middlings, and subsequently separately reducing  
20 said coarse and fine middlings by a series of partial reductions, and taking out flour resulting from each partial reduction.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in  
25 the presence of two witnesses.

SQUIRE THOMAS GREEN.

Witnesses:

J. W. GARNER,

M. C. GLADMOND.