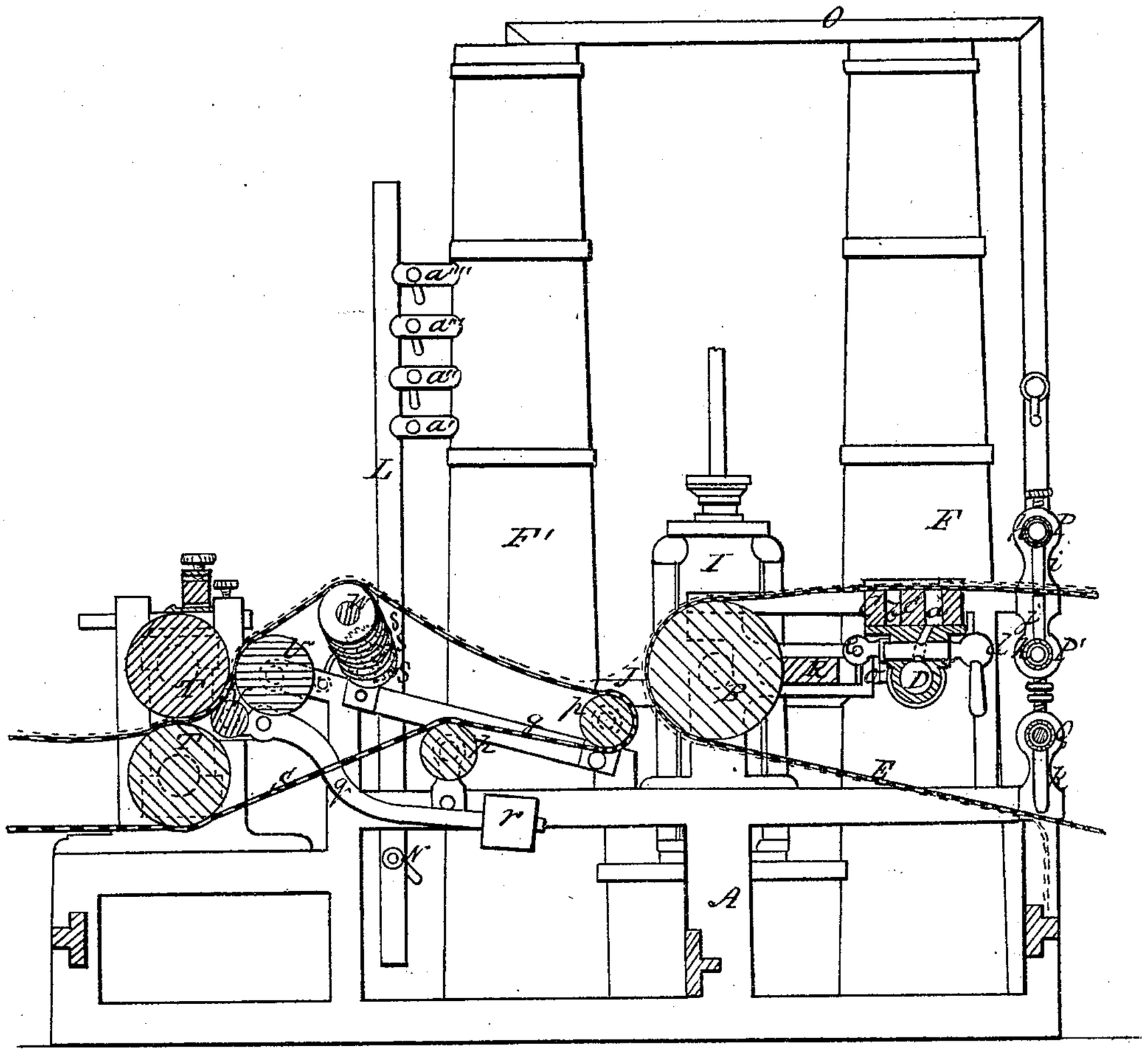
J. S. Blake. Sheet 1. 3 Sheets.

Paper Making Mach.

No. 16,430. Patented Jan. 20, 1857.

Fig. 1.

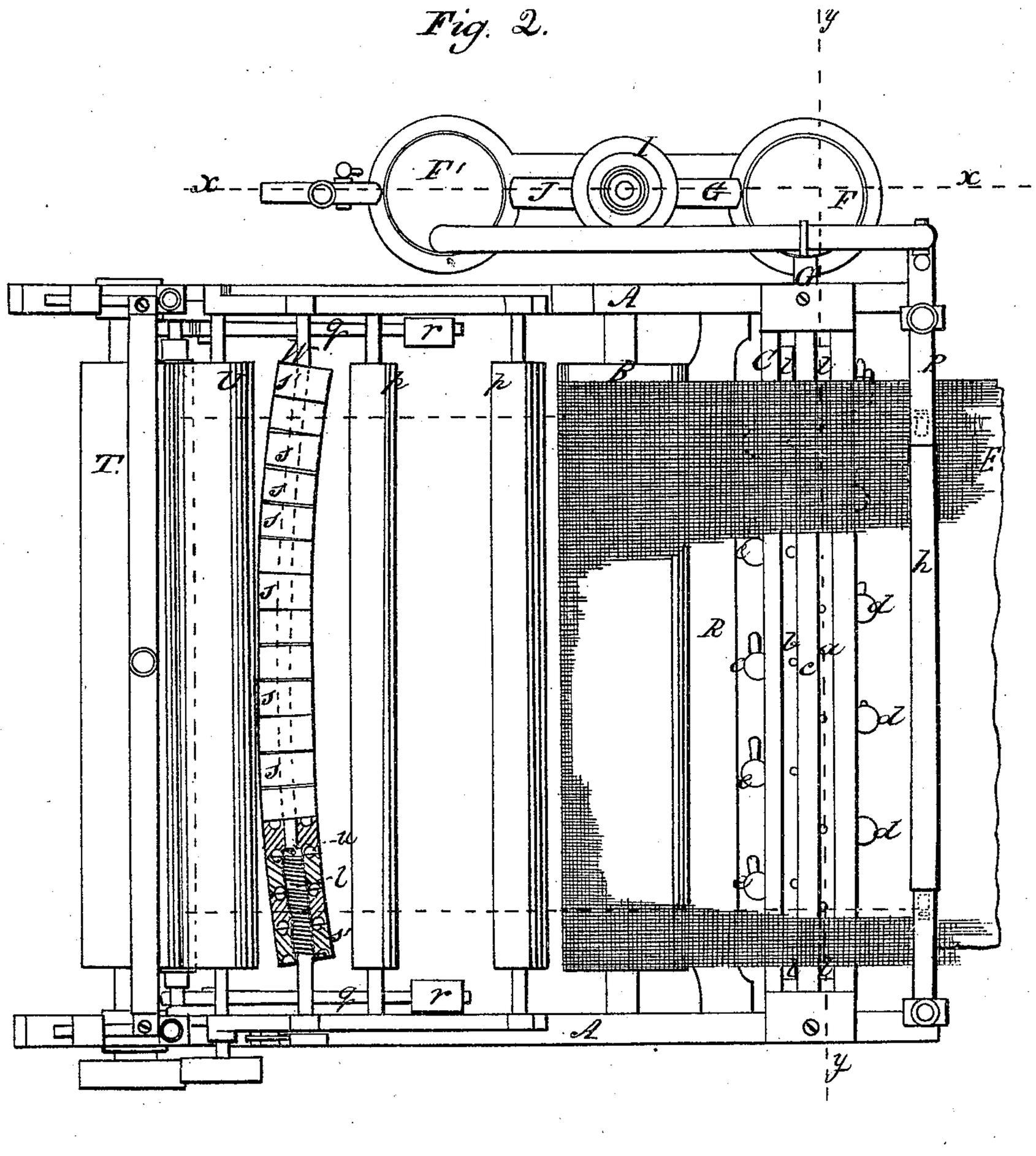


J. S. Blake. Sheet 2. 3 Sheets.

Paper Making Mach.

No. 16,430. Patented Jan. 20, 1857.

Fig. 2.



J. S. Blake. Sheet 3.3 Sheets.

Paper Making Mach.

No. 16,430 Patented Jan. 20, 1857.

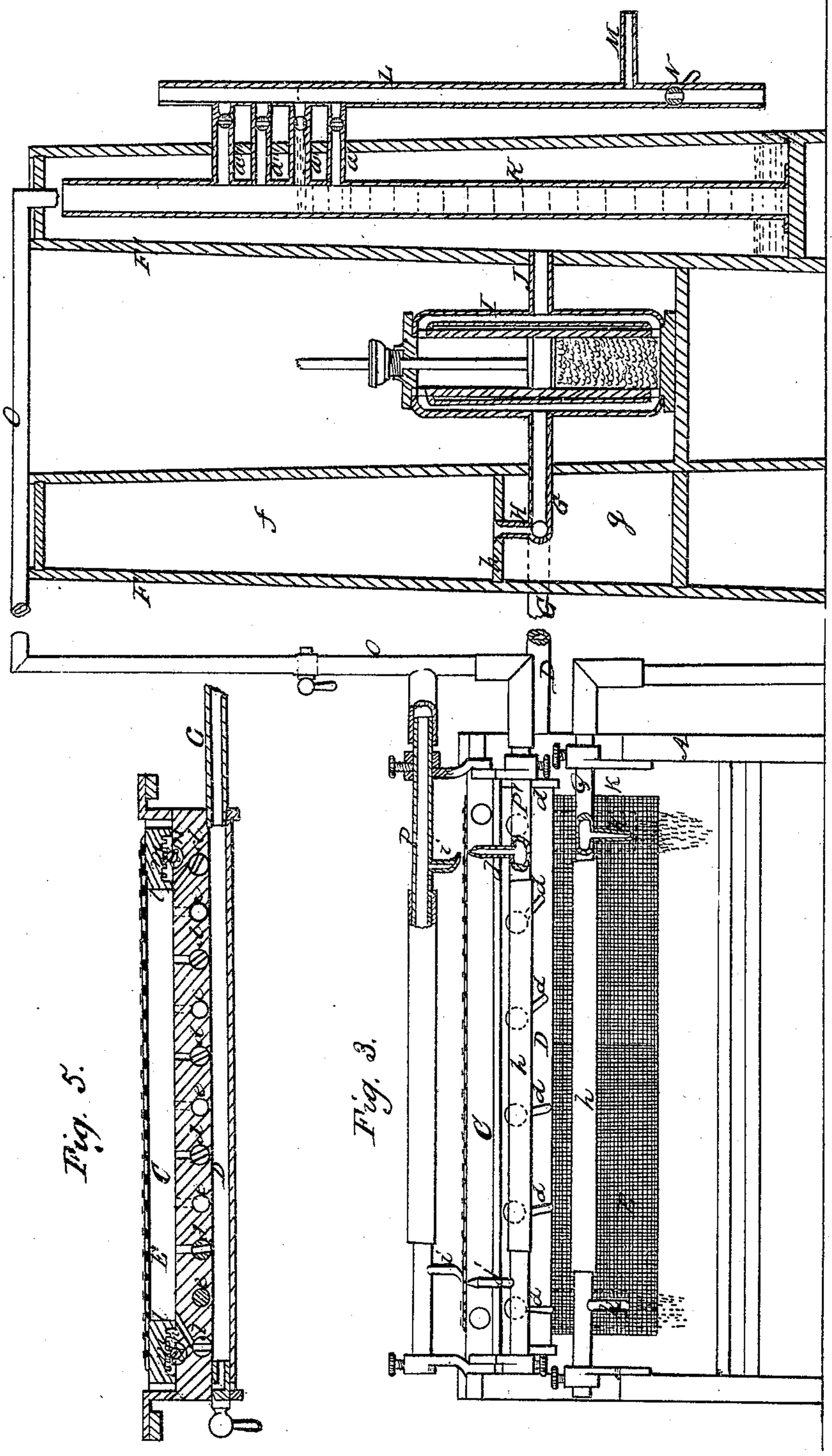


Fig. 4.

Fig. 5.

Fig. 3.

UNITED STATES PATENT OFFICE.

JOHN S. BLAKE, OF CLAREMONT, NEW HAMPSHIRE.

MACHINERY FOR MAKING PAPER.

Specification of Letters Patent No. 16,430, dated January 20, 1857.

To all whom it may concern:

Be it known that I, JOHN S. BLAKE, of Claremont, in the county of Sullivan and State of New Hampshire, have invented a new and Improved Machine for Manufacturing Paper; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1, is a longitudinal vertical section of my improvement, the plane of section being through the center. Fig. 2, is a plan or top-view of ditto. Fig. 3, is an end view of ditto. Fig. 4, is a vertical section of the pump, vacuum chamber, and water and air reservoir, with the necessary pipes attached; (*x*) (*x*) Fig. 2 showing the plane of section. Fig. 5 is a longitudinal vertical section of the suction or vacuum chest over which the endless wire cloth apron passes; (*y*) (*y*) Fig. 2, shows the plane of section.

Similar letters of reference indicate corresponding parts in the several figures.

The first part of my invention consists in a peculiar arrangement of parts, a pump, vacuum chamber, air and water chamber, pipes and vacuum chest, provided with cocks, as will be hereinafter fully shown and described whereby the pulp on the endless wire cloth apron is compressed and deprived of moisture by atmospheric pressure and the edges of the paper or pulp cut or trimmed in a perfect manner.

The second part of my invention consists in the peculiar means employed for discharging from the endless wire cloth apron the margins or strips of pulp cut off from the edges of the paper.

The third part of my invention consists in the peculiar means employed for stretching or keeping in a distended state and also guiding the endless felt apron which conveys the paper from the wire cloth apron to the usual pressure and heated cylinders.

To enable those skilled in the art to fully understand and construct my invention, I will proceed to describe it.

A represents a framing which may be constructed in any proper manner to support the working parts.

B represents a cylinder which is placed transversely on the framing A; and C, represents what I term a vacuum chest, which is also placed transversely on the framing A, just in front of the cylinder B. The chest, C is divided longitudinally into two compartments (*a*) (*b*), by a vertical partition (*c*), and both compartments communicate at their lower ends with a pipe D by means of cocks (*d*) (*e*) which are placed at each side of the lower part of the chest C, as shown in Fig. 1; the cocks at each side of the chest extending its whole length; the cocks being placed at a suitable distance apart as shown in Figs. 2 and 5. By means of these cocks either or both of the compartments (*a*) (*b*) may be made to communicate with the pipe D which is attached longitudinally to the under side of the chest C.

E represents an endless wire cloth apron which is constructed precisely similar to the ones now used on paper-making machines. This apron passes over the top of the chest C and around the cylinder B, as shown clearly in Fig. 1.

F, F^1 represent two upright trunks or conical or cylindrical vessels which are placed at one side of the framing A. The trunk or vessel F is divided into two compartments (*f*) (*g*) by a horizontal partition (*h*) and a pipe G passes horizontally through the lower compartment (*g*) and is connected to one end of the pipe D. A branch pipe H is connected with the pipe G within the compartment (*g*), the pipe G communicating with the upper compartment (*f*) in the trunk F see Fig. 4.

I is a pump which is placed between the trunks F, F′, and the pipe G communicates with it, said pipe being the suction pipe of the pump; and J is, a pipe also connected with the pump, said pipe communicating with the trunk F′ and being the force pipe of the pump. The pump I may be constructed in any proper manner, either a reciprocating or rotary pump may be used.

The trunk F′ has a vertical pipe K fitted within it. This pipe extends down to the bottom of the trunk and has its lower end perforated as shown in Fig. 4. The upper end of the pipe K is closed and a series of horizontal pipes (*a′*) (*a″*) (*a‴*) (*a⁗*) are attached to it near the upper end. These pipes are placed one above the other at suitable distances apart and pass through the side of the trunk and communicate with

the upper end of a vertical pipe L which has a pipe M, leading to a vat commonly termed the "save all." The lower end of the pipe L is provided with a cock N. To the upper end of the trunk F′, a pipe O is attached, the lower end of this pipe is connected to two horizontal pipes P, P′, placed one above the other at one end of the framing, and the apron E passes between the two pipes P, P′. These pipes P, P′, are each divided transversely or formed of two parts and they fit into tubes (*h*), so that one end of the pipes may be moved or shoved in and out of the tubes, and the pipes lengthened or contracted longitudinally as desired; each part of the two pipes P, P′, is provided with a short tube, the tubes (*i*) being on the upper pipe P, and the tubes (*j*) being on the lower pipe P′. The ends of the tubes (*i*) are slightly curved or bent, but the ends of the tubes (*j*) are straight as shown in Fig. 3. The points of the upper tubes (*i*) are directly over or a little at the inner side of the points of the lower tubes (*j*), and the two tubes of each pipe may be moved nearer together or farther apart as desired, by shoving the movable ends of the pipes P, P′, farther in or out of the tubes (*h*).

Q represents a horizontal pipe which is attached to the end of the framing A just below the pipe P′. The pipe Q is arranged precisely similar to the pipes P, P′, and is also provided with two tubes (*k*) (*k*) which project downward from it, the points of the tubes (*k*) being within a short distance of the upper surface of the lower part of the apron E. These tubes (*k*) as well as the tubes (*i*) (*j*) may be so constructed or arranged that they may be lengthened or shortened as desired in order that their points may be adjusted the proper distance from the apron.

Each compartment of the chest C is provided with a slide (*l*) one at each end, the slides having a rack (*m*) on their lower ends into which pinions (*n*) gear, see Fig. 5. By turning these pinions the slides may be adjusted nearer together or farther apart and the compartments increased or diminished in length as desired.

The cylinder B has a pressure bar R bearing longitudinally against it. This bar has its edge covered with felt and is made to bear against the cylinder B with a greater or less pressure by means of set screws (*o*) which act against each end of the bar. This felt absorbs the moisture on the cylinder B.

S, Fig. 1, represents an endless felt apron which works over rollers (*p*) (*p*) and passes between two wet-press cylinders T, T. The apron S also passes over a cylinder U placed just back of the upper cylinder T; and a roller V, which has its bearings in the ends of weighted levers (*q*), bears against the apron and presses it against the upper cylinder T. The pressure of the roller V against the apron S may be regulated or graduated as desired by adjusting the weights (*r*) on the levers (*q*).

W is a curved rod the ends of which are attached to the upper part of the framing A. Upon this rod W a series of rollers (*s*) are placed loosely and the apron S passes over them. These rollers assume the form of a curve corresponding of course with the rod W and stretch the apron S transversely, so that it will pass in a perfectly even and unwrinkled state between the cylinders T, T. The apron is also stretched longitudinally by varying the speed of the lower cylinder T, and the cylinder U; for instance, if the cylinder U is made to rotate a trifle slower than the lower cylinder T, it follows, as a matter of course, that the apron S as it passes between the cylinders T, T, will be stretched longitudinally.

It is important that the apron, S be guided properly while passing between the cylinders T, T. This is effected in the following manner: A spiral spring (*t*) is placed on each end of the curved rod W, and the inner ends of these springs are attached to the rod W as shown at (*u*) Fig. 2, the spring at one end of the rod only being shown. The outer ends of the springs are attached to the outermost rollers designated by (*s′*) two or more of the adjoining rollers being over the springs, but not connected to them. As the apron S works over the rollers (*s*), if it inclines or passes to either side out of a direct line, it will pass on to one of the outermost rollers (*s′*) and in so doing will rotate the roller (*s′*) and unwind the spring (*t*), the spring as it unwinds becomes increased in diameter and produces sufficient friction upon the adjoining rollers, which are over it, to retard their motion and thereby cause the apron to work off from them in a direct line. The outermost rollers at both ends of the rod W being similarly arranged, the apron is kept moving in a direct line or course.

The operation is as follows: The pulp shown in red passes on the wire cloth apron E in the usual manner. The length of the chambers (*a*) (*b*) in the chest C is made of the requisite length, corresponding to the desired width of the paper, by adjusting the slides (*l*). The pump I is put in operation and a suction or vacuum is produced in one or both of the chambers (*a*) (*b*) as desired. This suction is made equal or uniform the entire length of the chambers by adjusting the cocks (*d*) (*e*), so that the communications between the chambers (*a*) (*b*) and the pipe D are gradually enlarged, from, the junction of the pipe G with the pipe D to the opposite end of the pipe D see Fig. 5. If the communications were of equal size

throughout, the suction would be the strongest nearest the end of the pipe G, and an unequal pressure would be produced upon the pulp. As the pulp passes over the chest C on the apron F the pressure of the atmosphere caused by the vacuum produced within the chest C drives or expels the moisture from the pulp. The water and air is drawn down within the pipe D through the pipe G into the pump I and both are forced into the trunk F′, the water falling to the bottom of the trunk in consequence of its superior gravity, the air, being above it. As the operation continues the water, shown in blue, will be forced upward within the pipe K in consequence of the pressure of the air in the trunk F′, and the water passes through one of the pipes (*a′*) into the pipe L and is conveyed by the pipe M to the "save all" or any proper receptacle. The air in the upper part of the trunk F′ passes through the pipe O and into the two pipes P, P′, and is ejected through the tubes (*i*) (*j*). The air as it is ejected through the tubes (*i*) (*j*) cuts the edges of the pulp and a clear edge is formed at each side of the paper. The upper tubes (*i*) having their points or ends bent or curved, as shown, the air ejected therefrom acts obliquely upon the pulp and serves to smooth all unevenness or roughness produced by the vertical blasts, from the tubes (*j*).

The pulp, it will be seen, is cut at its edges before it reaches the chest C, and when the moisture is expelled from it, an open space being formed by the cuts between the strips cut off by the blasts and the paper, the paper is prevented from absorbing moisture from the wire apron, as no communication is formed whereby the moisture on the edges of the apron can reach the pulp, the strips absorbing the moisture at the edges of the apron, and compensating for the lateral play of the apron. The strength of the blasts from the tubes (*i*) (*j*) is regulated by varying the height of the column of water in the pipe K. If thick paper is being made the column of water is increased in height by closing the lower pipes (*a′*) etc., and leaving the uppermost (*a′′′′*) open. If paper of medium thickness is being made the pipe (*a′′*) or (*a′′′*) is left open and the lower one closed. The greater the height of the column of water the stronger the blasts will be for the gravity of the water serves as a counterpoise to the air forced within the trunk F′.

The chamber (*f*) within the trunk F serves to equalize the vacuum within the chest C, for as the pump I operates, the air is exhausted from the chamber (*f*) and consequently a continuous suction or draw is produced, and the pulsations of the pump are compensated for in the same manner as an air vessel compensates for the unequal action of a pump in discharging water.

The felt apron S receives the paper from the wire cloth apron E and passes between the wet-press rollers T, T, and also between the usual heated cylinders, the apron being stretched and properly guided as previously described, and the roller, V, by its pressure, which may be graduated as previously described, compresses the paper, and the moisture expelled therefrom is absorbed by the apron.

The strips or margins of pulp cut off from the paper by the blasts from the tubes (*i*) (*j*) are discharged from the apron E by jets of water which flow from the tubes (*k*) (*k*) of the pipe Q as clearly shown in Figs. 1, and 3, the pipe Q being supplied with water in any proper manner.

This machine has been practically tested and operates rapidly and well in manufacturing all kinds of paper. It possesses many advantages over the ordinary Fourdrinier machine; there are no cylinders to injure the wire-cloth apron by forcing into it sand or other hard substances which the pulp may contain. The machine may be run with much greater speed without crushing the pulp. It is also much simpler in construction, not at all liable to get out of repair, is less expensive to operate, enabling us to work more water with the pulp and consequently work longer stuff or fiber thereby producing a stronger sheet, and the wire apron will be kept perfectly clean from grease, pitch or other foreign substances which the pulp may contain.

I do not claim expelling or forcing the moisture from the pulp by means of atmospheric pressure irrespective of the means employed for effecting that purpose as herein described, but

What I do claim as new and desire to secure by Letters Patent, is—

1. The employment or use of the pump I, vacuum chamber (*f*) and vacuum chest C provided with the two compartments (*a*) (*b*) and communicating with the pipes D, G, by means of the cocks (*e*) (*d*), the above parts being arranged substantially as herein shown and described for the purpose set forth.

2. I claim the air and water trunk or reservoir F′ provided with the pipe K and communicating with the external pipe L as shown, the reservoir communicating by means of a pipe O with the pipes P, P′, having the tubes (*i*) (*j*) connected to them, the whole being arranged substantially as described for the purpose of trimming the edges of the paper or pulp, and I further claim trimming the edges of the pulp by means either of air or steam when ejected through tubes (*i*) (*j*) arranged as shown.

3. I claim the pipe Q with the tubes (*k*)

attached and arranged as shown, for the purpose of discharging the margins or strips of pulp from the wire cloth apron E.

4. I claim the curved rod W, with the rollers (*s*) (*s'*) placed on it, the roller (*s'*) being connected with the springs (*t*) and arranged as shown and described, whereby the felt apron S is stretched or distended transversely, and also guided or properly retained in position as it operates.

5. I claim the cylinder U in combination with the wet press cylinders T, T, when the speed of the cylinder U and cylinders T, T, is made variable for the purpose of stretching or distending the apron S longitudinally as herein described.

JOHN S. BLAKE.

Witnesses:
W. TUSCH,
A. K. HAIGHT.