

(No Model.)

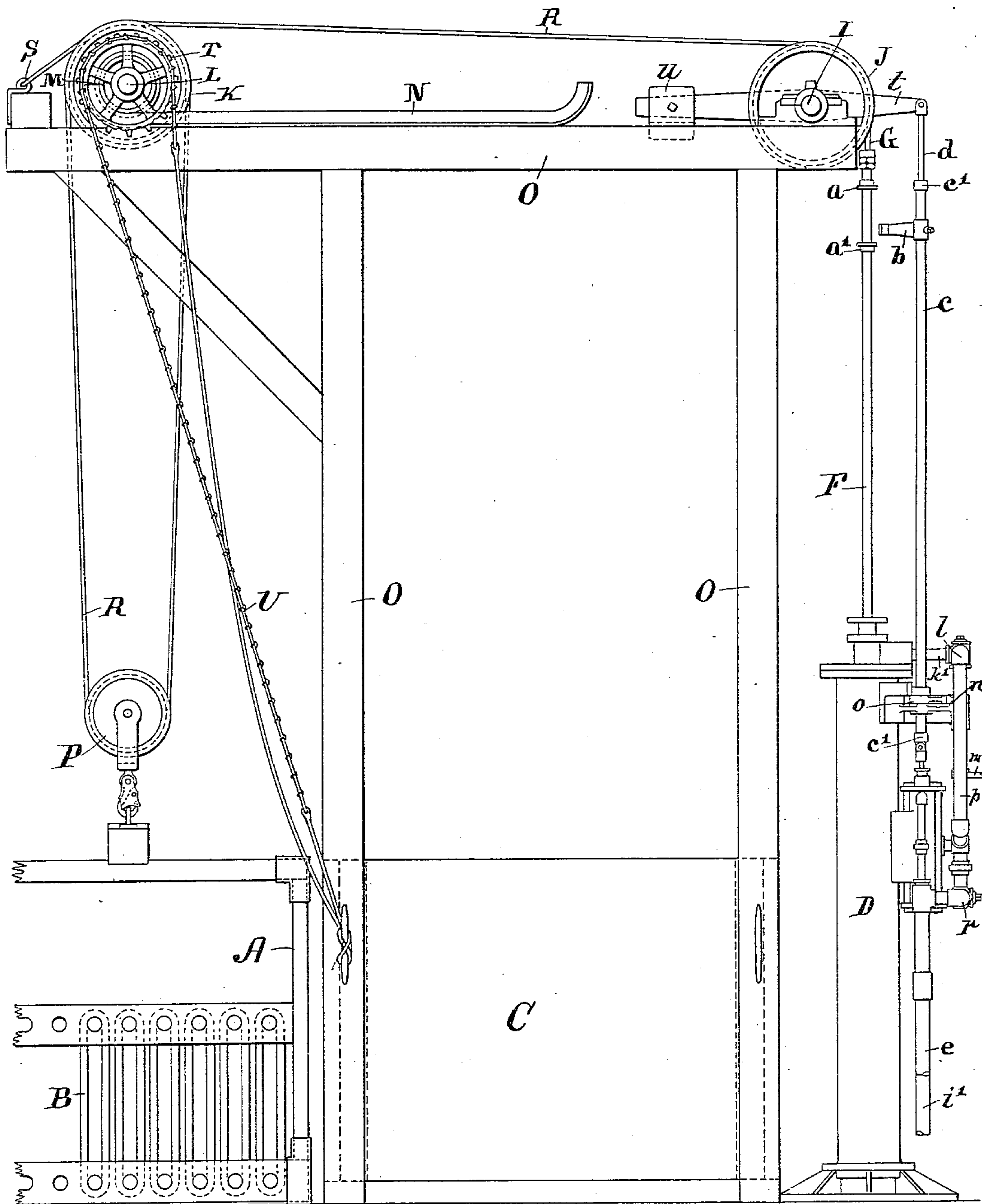
5 Sheets—Sheet 1.

A. FALKENAU & H. L. HUND.
DYEING MACHINERY.

No. 560,125.

Patented May 12, 1896.

Fig. 1



Witnesses:
W. A. Schaefer
Craig Shields

Inventors.
Arthur Falkenau
Hugo L. Hund
by their attorney
Chas A. Rutter.

(No Model.)

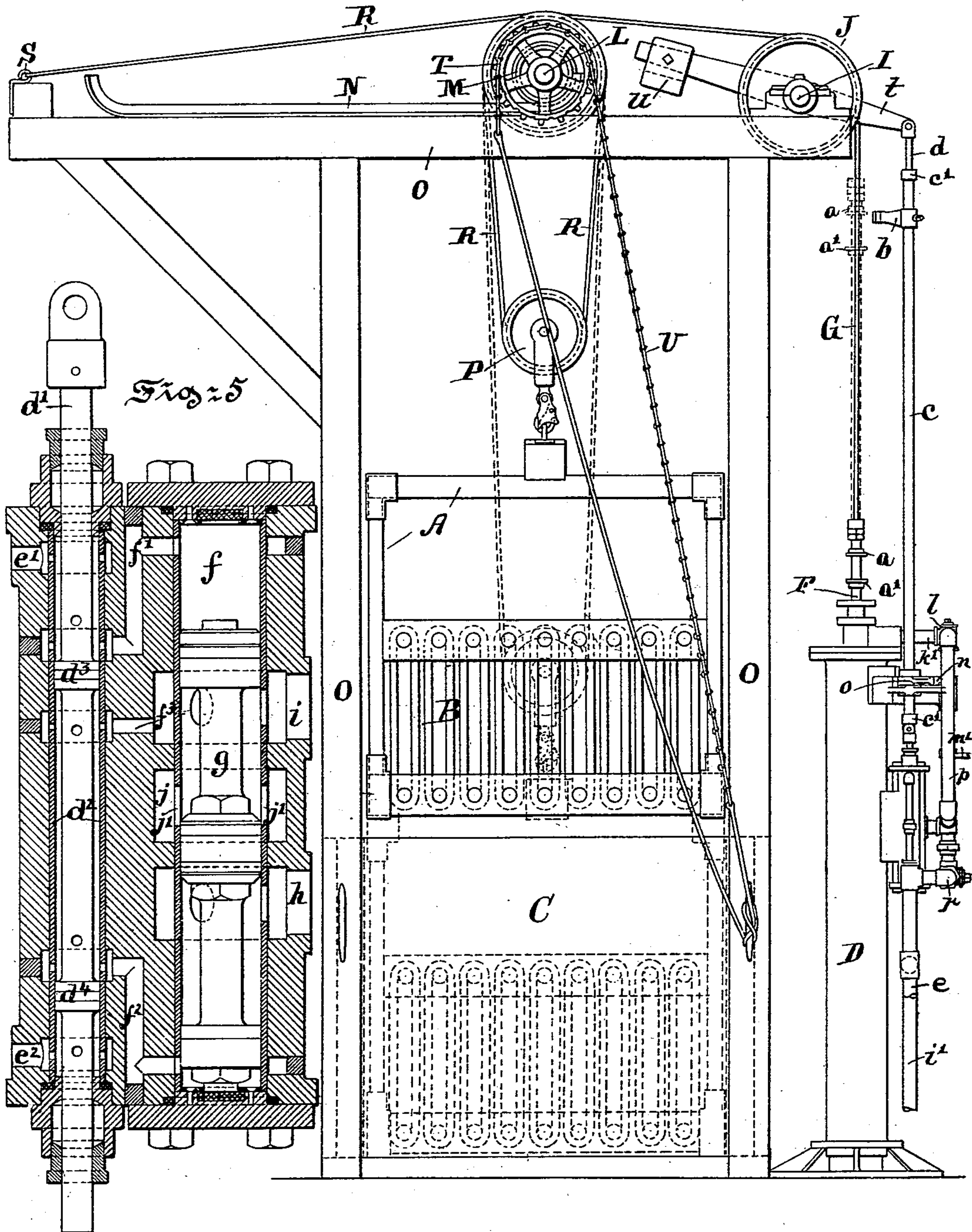
5 Sheets—Sheet 2.

A. FALKENAU & H. L. HUND.
DYEING MACHINERY.

No. 560,125.

Patented May 12, 1896.

Fig: 2



Witnesses:
W. A. Schaffner
Craig Shields

Inventors:
Arthur Falkenau
Hugo L. Hund
by their Attorney
Chas A. Rutter

(No Model.)

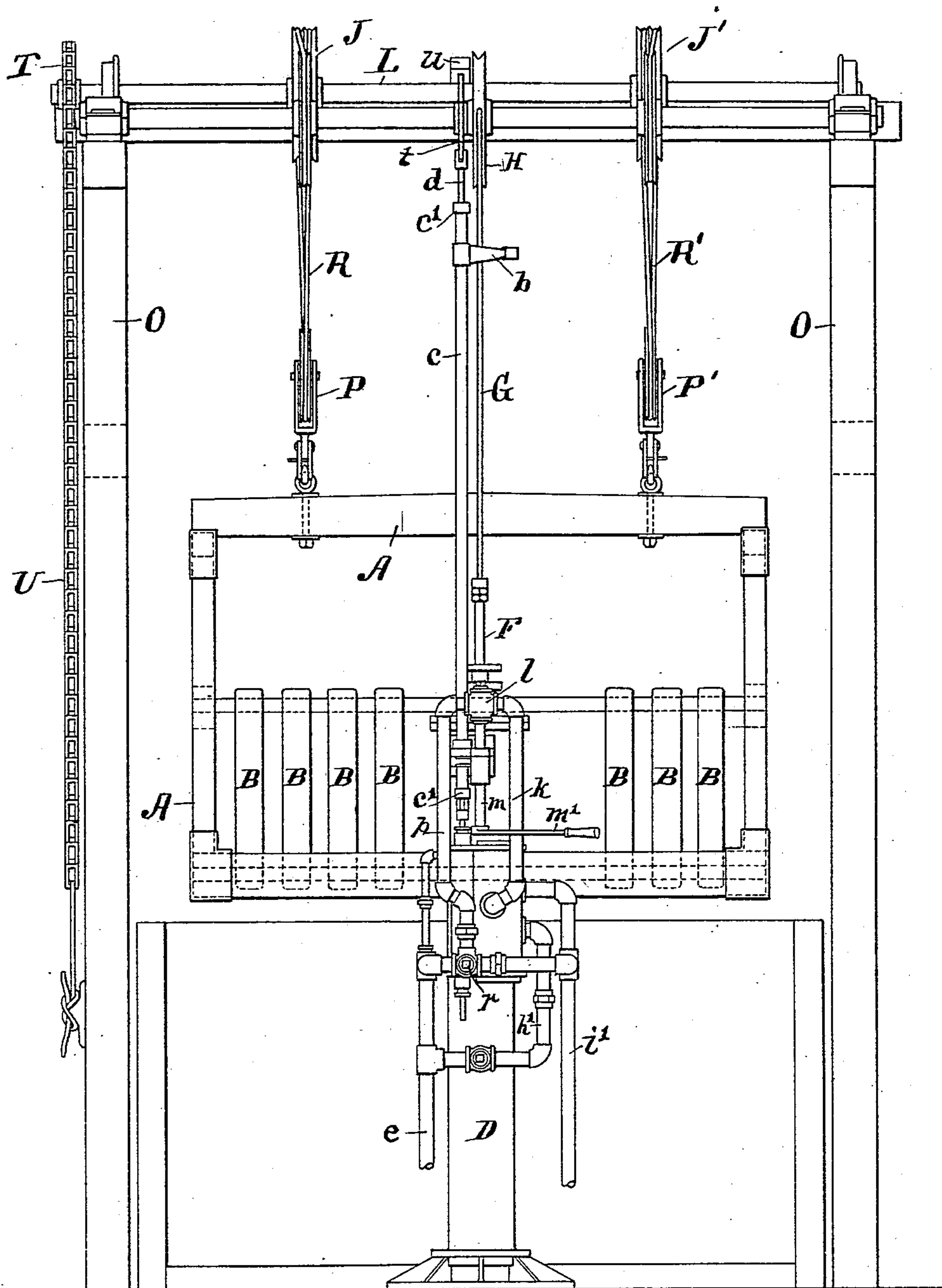
5 Sheets—Sheet 3.

A. FALKENAU & H. L. HUND.
DYEING MACHINERY.

No. 560,125.

Patented May 12, 1896.

Fig. 3



Witnesses:
W. A. Schaefer
Craig Shields

Inventors:
Arthur Falkenau
H. L. Hund
by their attorney
Chas. A. Rutter

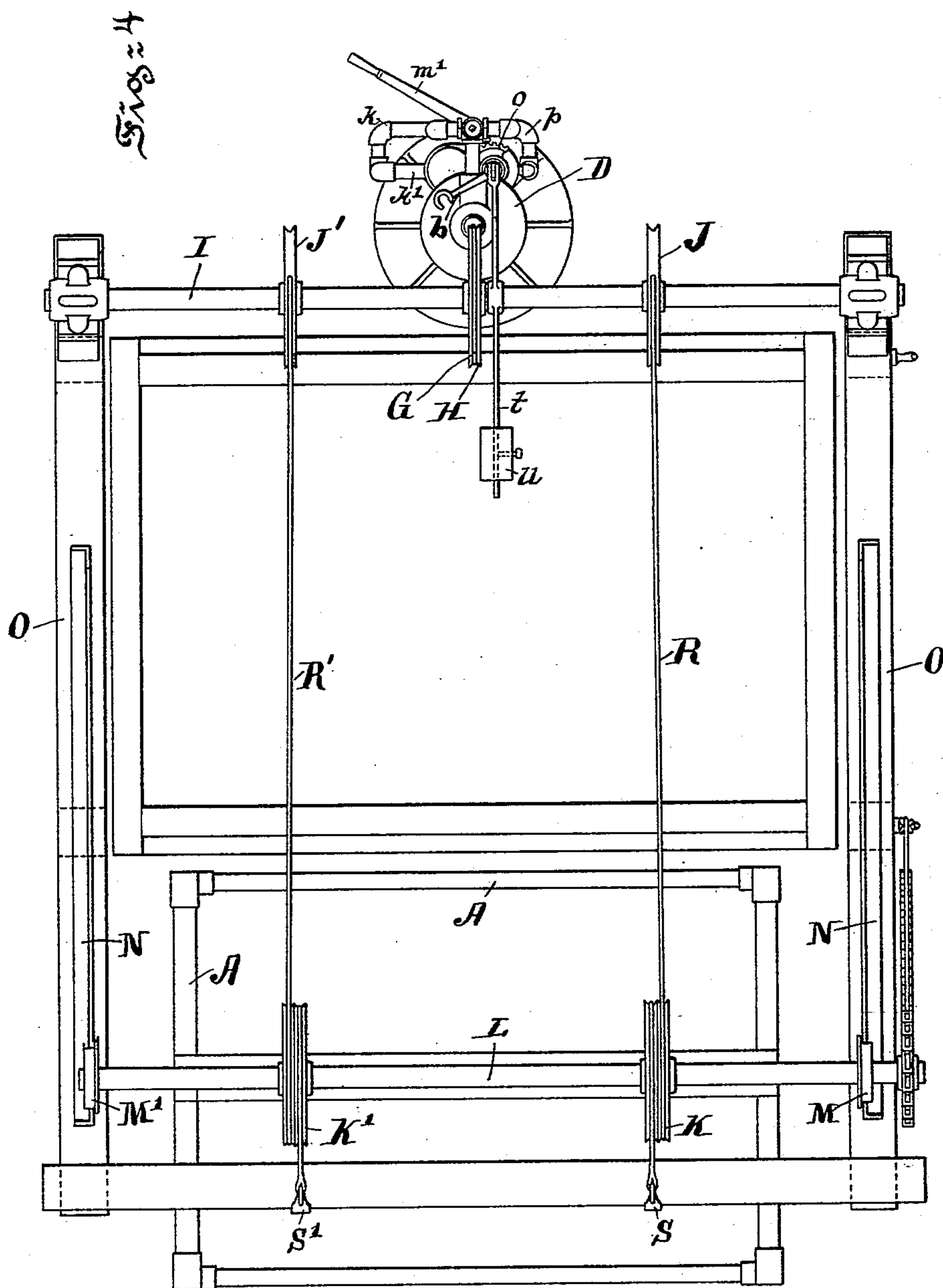
(No Model.)

5 Sheets—Sheet 4.

A. FALKENAU & H. L. HUND.
DYEING MACHINERY.

No. 560,125.

Patented May 12, 1896.



Witnesses
W. G. Schaeffer
Craig. Shields

Inventors.
Arthur Falkner
Hugo L. Hund
by their attorney
Chas A. Butler.

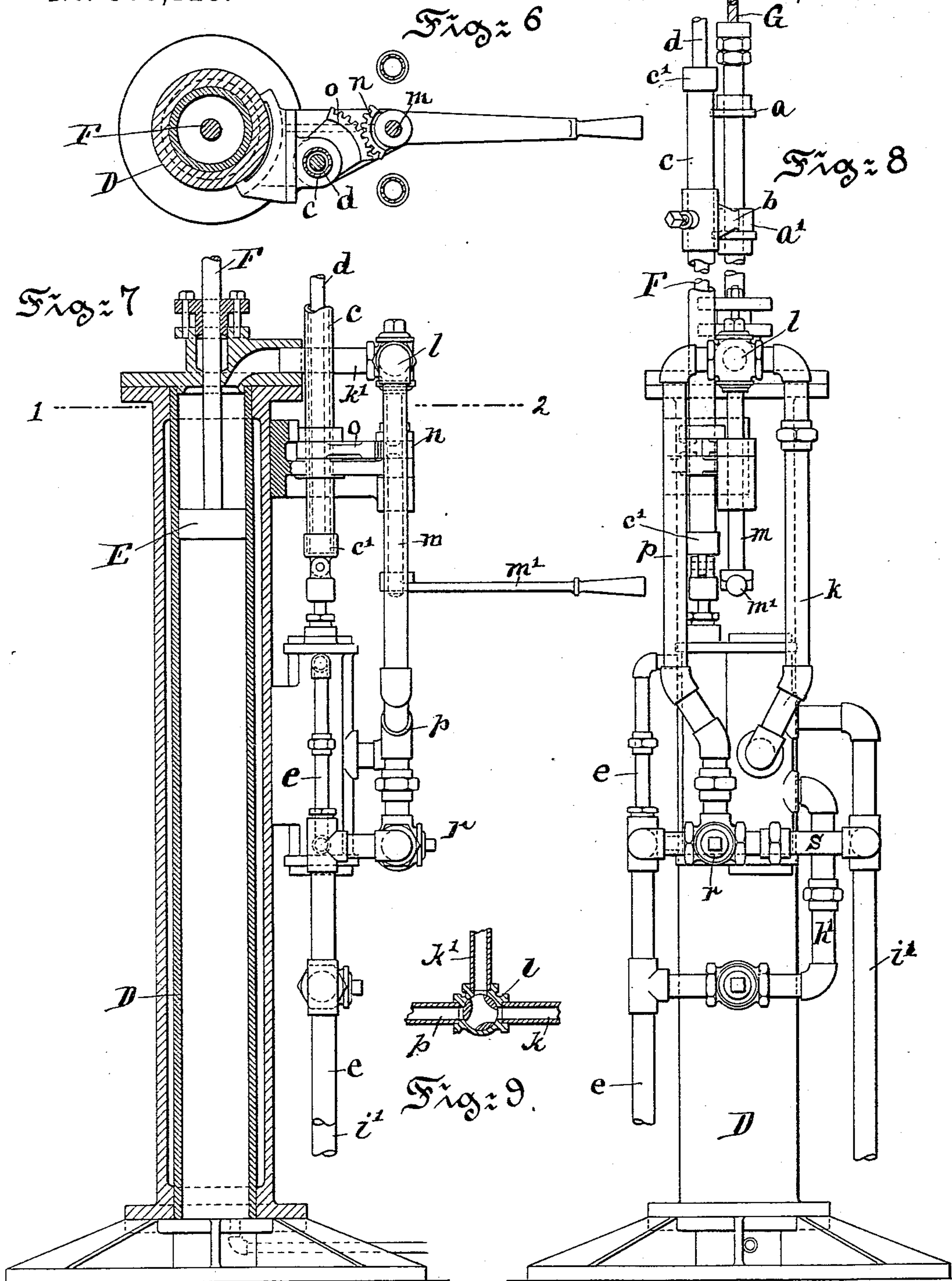
(No Model.)

5 Sheets—Sheet 5.

A. FALKENAU & H. L. HUND.
DYEING MACHINERY.

No. 560,125.

Patented May 12, 1896.



Witnesses:
W. A. Schaefer
Emig Shields

Inventors.
Arthur Falkenau
Hugo L. Hund
by their attorney
Chas A. Patter.

UNITED STATES PATENT OFFICE.

ARTHUR FALKENAU, OF PHILADELPHIA, AND HUGO L. HUND, OF RIDLEY PARK, PENNSYLVANIA, ASSIGNORS TO WILLIAM H. LORIMER AND JOHN W. BIRKEY, OF BRISTOL, PENNSYLVANIA.

DYEING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 560,125, dated May 12, 1896.

Application filed November 30, 1895. Serial No. 570,594. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR FALKENAU, a resident of the city and county of Philadelphia, and HUGO L. HUND, a resident of Ridley Park, in the county of Delaware, State of Pennsylvania, citizens of the United States, have invented certain new and useful Improvements in Dyeing Machinery, of which the following is a specification.

Our invention relates to improvements in dyeing machinery, and more particularly to improvements in the machinery for moving the yarn to be dyed in the vat containing the dye liquid; and the object of our invention is to furnish a machine which will during the operation of dyeing operate automatically to reciprocate the cage carrying the yarn in the dye liquid, and which will also be capable of a movement to lift said cage and yarn, when the later has been dyed, out of and away from the vat.

In the accompanying drawings, forming part of this specification, and in which similar letters of reference indicate similar parts throughout the several views, Figure 1 is a side elevation of our dyeing-machine and the parts connected with it, the cage carrying the yarn being shown out and to the side of the vat; Fig. 2, a similar view, the cage carrying the yarn being shown suspended above the vat; Fig. 3, a front elevation of Fig. 2; Fig. 4, a plan of Fig. 1; Fig. 5, a central vertical sectional elevation through the valves which control the flow of liquid to the main operating-cylinder of the machine; Fig. 6, a section of Fig. 7 on line 1 2; Fig. 7, a central sectional elevation through the main operating-cylinder of our machine, the valve-casings, the liquid-pipes, &c., being shown in elevation; Fig. 8, a front elevation of Fig. 7, and Fig. 9 a sectional plan of the three-way valve *l*.

A is the yarn-carrying frame; B, the yarn; C, the vat in which the dye liquid is contained.

D is a vertical cylinder furnished with a piston E, Fig. 7, which carries a piston-rod F, to the upper end of which is attached one end of a cord or chain G, which passes around and the other end of which is fast to a pulley H, which is fast to a shaft I.

J J' are pulleys fast to shaft I; K K', pulleys on a shaft L.

M M' are wheels which carry shaft L, and which are adapted to run upon tracks N, carried by the frame O.

P P' are pulleys attached to cage A.

R R' are cords or chains, one end of which is attached to pulleys J J', which pass around pulleys K K', then down and around pulleys P P', then up and over pulleys K K', and the other ends of which are made fast to some fixed point, as S S', on the frame O to the rear of the pulleys J J'. The action of these parts of the machine will be hereinafter described.

In order to evenly and quickly dye the skeins of yarn B, it is essential that they be moved about while in the dye liquid, so that this liquid may be brought in contact with every part of the yarn, and we will describe this movement of our machine first.

We will suppose the frame A, which carries the skeins of yarn, to be immersed in the dye liquid in the vat C, as shown by dotted lines in Fig. 2, and the piston E within cylinder D to be at its extreme highest point. Liquid being now admitted at the upper end of cylinder D drives the piston E down, and the cord or chain G is drawn down with it, causing the pulley H, shaft I, and pulleys J J' to be revolved and the cords or chains R R' to be wound up on the pulleys J J'. These cords, as previously described, pass over the pulleys K K', then down and under pulleys P P', then up and over pulleys K K', and are fast to fixed points, as S S'. As these cords are wound up on the pulleys J J' the bights in which the pulleys P P' are carried are shortened, and these pulleys and the frame A are raised. The piston E and piston-rod F continue to fall until the tappet *a* on the piston-rod F engages an arm *b*, which is carried on a sleeve *c*, which surrounds and is carried on a rod *d*, which forms a continuation of the piston-rod *d'*. (Best shown in Fig. 5.) The sleeve *c* is prevented from moving laterally on rod *d* by means of collars *c'*, carried by this rod.

When the tappet *a* strikes the arm *b*, it carries this arm, the rod *d*, and the piston-rod *d'*

down with it until this latter reaches the end of its stroke, as shown in Fig. 5. The action of the machine is now reversed. The piston E and the parts connected with it rise, and the frame A and its connected parts fall until tappet a' on piston-rod F engages and lifts the arm b , which, through rod d , lifts piston-rod d' and causes the action of the valves to be reversed, when the piston E again falls.

This reciprocating action is continued as long as may be necessary to thoroughly dye the yarn.

The tappets a a' , as well as the arm b , are adjustable, the former upon the rod F and the latter upon the sleeve c , in order that the stroke of the reciprocating movement of the frame A may be made greater or less, as desired.

The construction and operation of the valve mechanism for performing the above motions are as follows: Upon the piston-rod d' are two pistons d^3 d^4 , which work in a cylinder d^2 , bolted to or formed in the casting of cylinder D. At either end of cylinder d^2 are ports e' e^2 for the admission of liquid, which is carried to these ports through a supply-pipe e . (Best shown in Figs. 7 and 8.) f , Fig. 5, is a cylinder, the ends of which are connected with cylinder d^2 by means of ports f' f^2 , and in which is placed a piston-valve g . h is a liquid-inlet in cylinder f , connected with supply-pipe e by means of a pipe h' , Figs. 7 and 8. i , Fig. 5, is an exhaust-opening from the cylinder f , which is connected to the exhaust-pipe i' , Figs. 7 and 8. j , Fig. 5, is a chamber surrounding cylinder f and connected therewith by ports j' . A pipe k leads from this chamber to a three-way valve l , and a pipe k' connects this valve with the upper end of cylinder D. The cylinder D is single acting, the liquid only acting to drive down the piston E, the weight of the frame A and its connected parts being always sufficient to operate this piston in the reverse direction.

Supposing that the piston E has been driven down until tappet a has lowered arm b , which has driven down piston-rod d' and pistons d^3 d^4 into the positions shown in Fig. 5, the liquid under pressure in the supply-pipe e is now admitted through port e' into cylinder d^2 above piston d^3 , passes from this cylinder through port f' to cylinder f , drives down piston-valve g , the liquid under which passes through port f^2 to cylinder d^2 , thence to port f^3 , and thence to the exhaust-port i and pipe i' . The piston g on being lowered cuts off the supply of liquid, which enters port h , Fig. 5, through pipe h' , Fig. 8, to the chamber j and to the upper end of the cylinder D and opens the exhaust-port i . The weight of the cage A and its connected parts now commences to act. The cage A falls and piston E rises, being drawn upward by means of cord G, attached to piston-rod F, and the liquid in cylinder D passes through pipe k' , valve l , pipe k to cylinder f , thence through exhaust-port i to pipe i' , and away. While this has been

taking place, piston d^4 in cylinder d^2 has cut off all the liquid to the lower end of cylinder f . When the cage A falls a sufficient distance, the tappet a' on piston-rod F engages and lifts the arm b , which draws up rod d' , causing piston d^3 to close port f' and piston d^4 to open port f^2 . The liquid from the supply-pipe e now passes into cylinder d^2 through port e^2 , passes thence through port f^2 to bottom of cylinder f , raises piston-valve g , which closes the flow of liquid to the exhaust-pipe i' , and permits the liquid to pass from the supply-pipe e through pipe h' to cylinder f , from which it passes to chamber j through ports j' , thence through pipe K to cylinder D, causing piston E to fall until the tappet a again operates arm b to reverse the flow of liquid, as before described.

The movements above described are entirely automatic and continue until stopped by the turning of the valve l or until the supply of liquid is otherwise cut off.

The upper end of the rod d is pivotally connected to one end of an arm t , which is loosely carried on the shaft I, the other end of this rod being furnished with a counterweight u to counterbalance the weight of the rod d , the piston-rod d' , and their connected parts. The arm t also serves as a guide or support for the upper end of rod d .

After the yarn has been dyed and it is desired to remove the frame carrying the skeins from the vat C we cause the arm b to be thrown out of contact with rod F and tappets a a' . We now admit the liquid directly to the cylinder D until the piston E is driven to its bottom and the frame A raised completely above the top of vat C. Our mechanism for accomplishing this is as follows:

m is a spindle connected with and operating the valve l , which is of the ordinary three-way construction; m' , a handle by means of which this spindle may be turned.

n , Figs. 6, 7, and 8, is a segmental rack carried by the spindle m and gearing with a segmental rack o , which is carried by the sleeve c , which surrounds and is carried by rod d .

p is a pipe connecting the supply-pipe e and the three-way valve l .

r is a three-way valve of ordinary construction on this pipe.

When it is desired to raise the frame A from the vat C, the handle m' is turned so that the valve l closes the connection to the pipe k and opens those to the pipes k' and p . The same movement throws the arm b away from the rod F, as shown in the full lines in the drawings. The cock r is now opened and the liquid passes from pipe e through pipe p to valve l , thence to k' to cylinder D, and drives piston E to the bottom of the cylinder and raises the frame A clear of vat C, as shown in Fig. 2. When the frame A has been moved to one side of the vat and it is desired to lower it to the floor or to a truck or carriage, the valve r is turned so as to close off the connection to pipe e and open the connection to pipe

s, which connects with exhaust-pipe *i*, and the liquid passes from cylinder D through pipe *h'*, valve *l*, pipe *p*, valve *r*, and pipe *s* to exhaust-pipe *i'*.

5 In order to carry the frame A from the vat C, the shaft L, which carries pulleys K K', is mounted upon wheels M M', which are adapted to run upon tracks N N'. Upon one or both ends of shaft L we place a sprocket-
10 wheel T, upon which is a chain U. When it is desired to move frame A, the chain U is operated so as to turn wheel T, and the shaft L and wheels M are caused to travel either backward or forward, as may be desired.

15 Having thus described our invention, we claim—

1. The combination of the main cylinder, piston and piston-rod, tappets carried by said piston-rod, a hydraulic valve for controlling
20 the flow of liquid to and from said main cylinder, a supply and an exhaust pipe for conducting liquid to and from said valve, a rod connected to the operating-piston of said hydraulic valve, a sleeve carried by said rod, an
25 arm carried by said sleeve adapted to be engaged by said tappets to throw said operating-valve in either direction, a three-way valve, a pipe leading from said hydraulic valve to said three-way valve, a pipe connecting said
30 three-way valve with the main cylinder, a spindle by means of which said valve may be turned, a segmental rack connected to and turning with said spindle, a segmental rack secured to the sleeve on the rod connected with
35 the operating-piston of the hydraulic valve

which engages with and is turned by said first segmental rack, a handle by means of which said valve-spindle may be turned, a pipe leading directly from the supply-liquid pipe to said three-way valve, a stop-cock on said pipe, 40 and a pipe leading from said stop-cock to the exhaust-pipe, all substantially as and for the purposes set forth.

2. The combination in a hydraulic engine of a main cylinder, piston and piston-rod, 45 tappets on said rod, a hydraulic valve substantially as described, connections for carrying liquid to and away from said hydraulic valve and main cylinder, a rod connected to the operating-piston of said valve, a sleeve 50 carried by said rod, an arm carried by said sleeve and adapted to be operated by said tappets in order to throw said hydraulic valve to automatically control the flow of liquid to and from said main cylinder, connections for 55 conducting liquid directly to and from said main cylinder, and mechanism for simultaneously closing the connections between said hydraulic valve and main cylinder and for rotating said sleeve on said rod connected to 60 the operating-piston of the hydraulic valve in order to throw the arm carried by said sleeve outward and away from the tappets on the main piston-rod.

ARTHUR FALKENAU.
HUGO L. HUND.

Witnesses:

SAML. B. S. BARTH,
CHAS. A. RUTTER.