

(No Model.)

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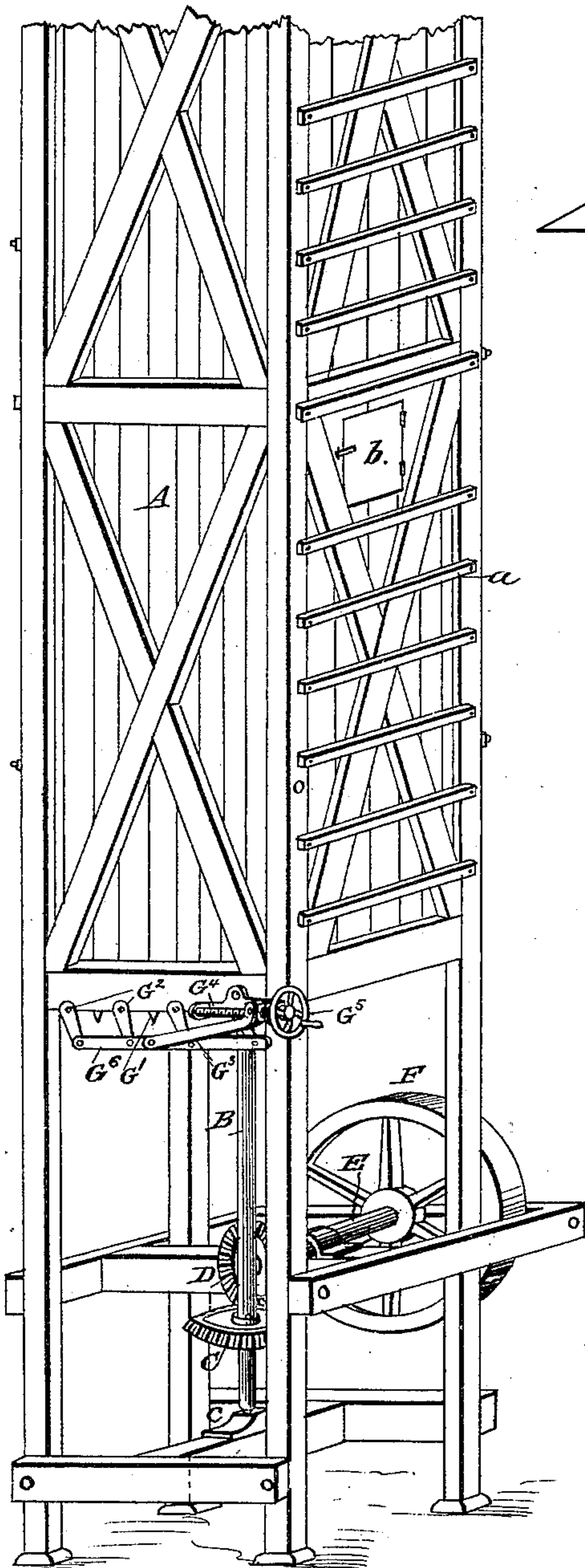
O. A. BENKENDORF.

AIR DRAFT ENGINE.

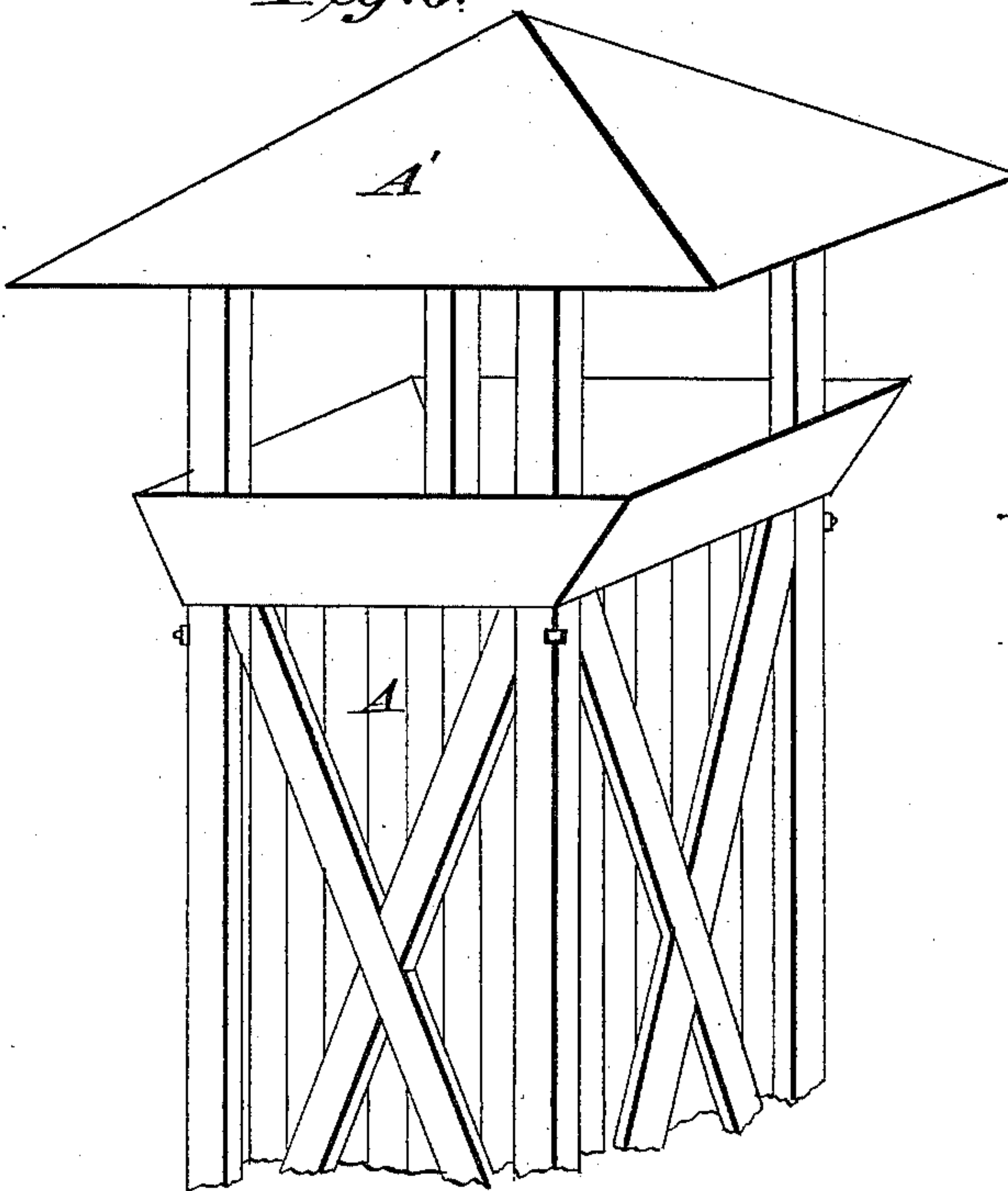
No. 395,418.

Patented Jan. 1, 1889.

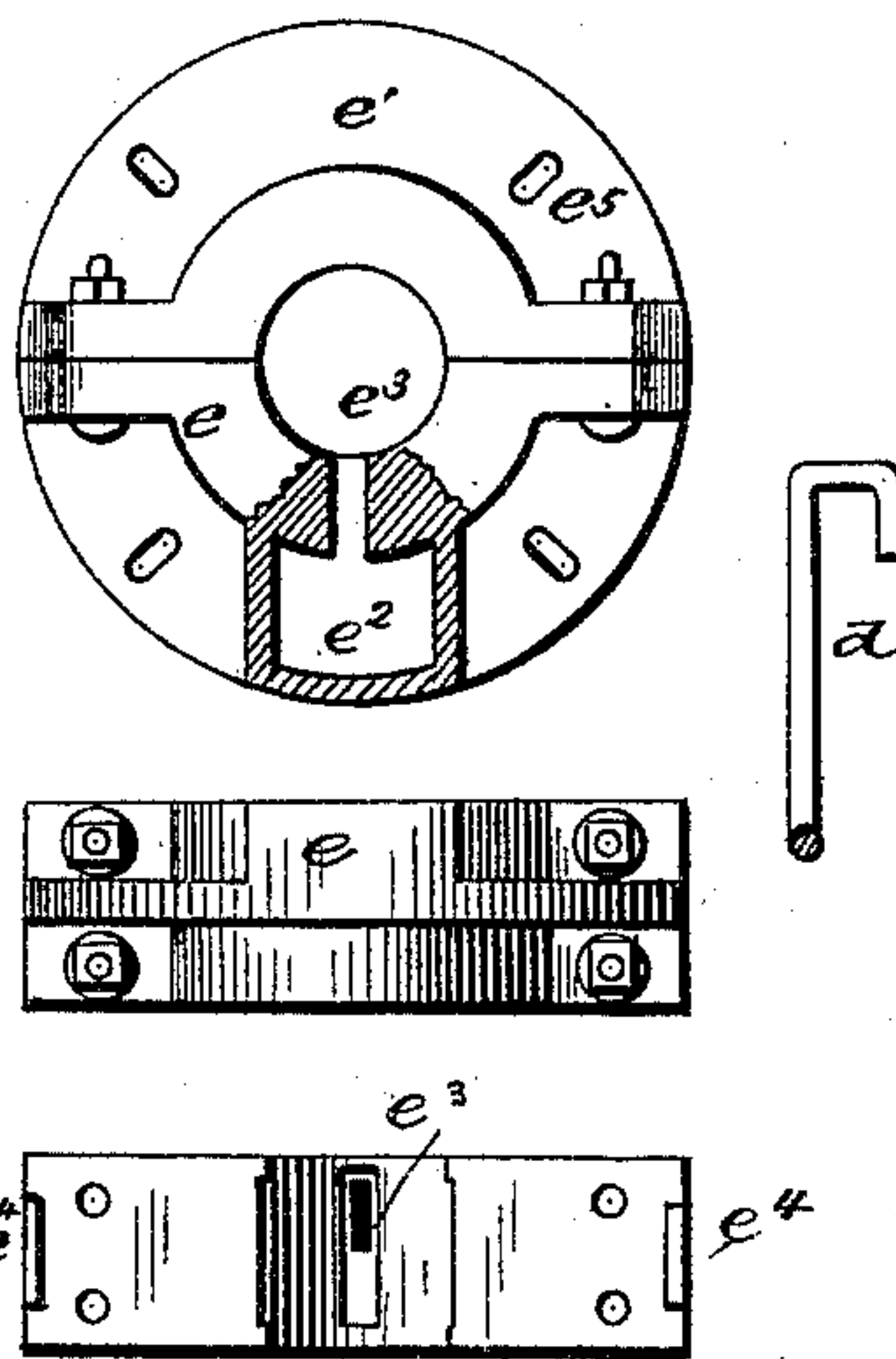
*Fig. 1.*



*Fig. 6.*



*Fig. 5.*



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ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

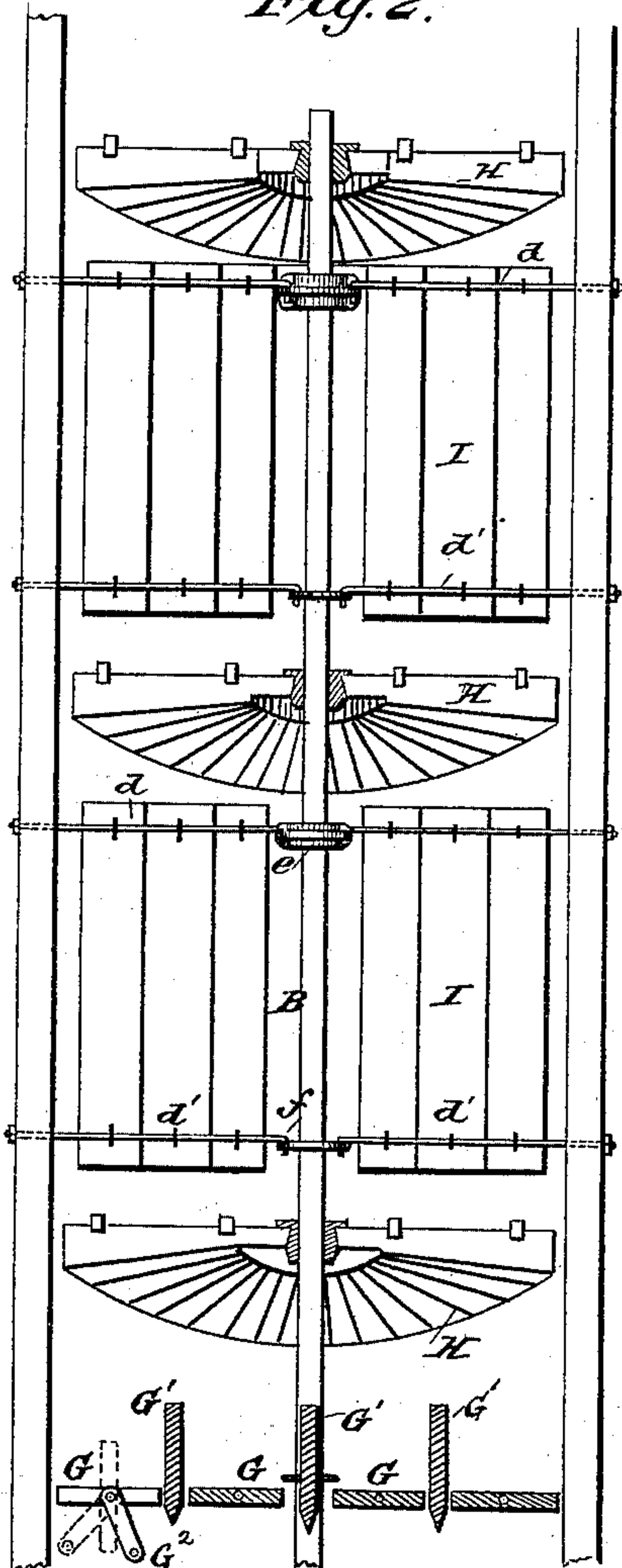


Fig. 3.

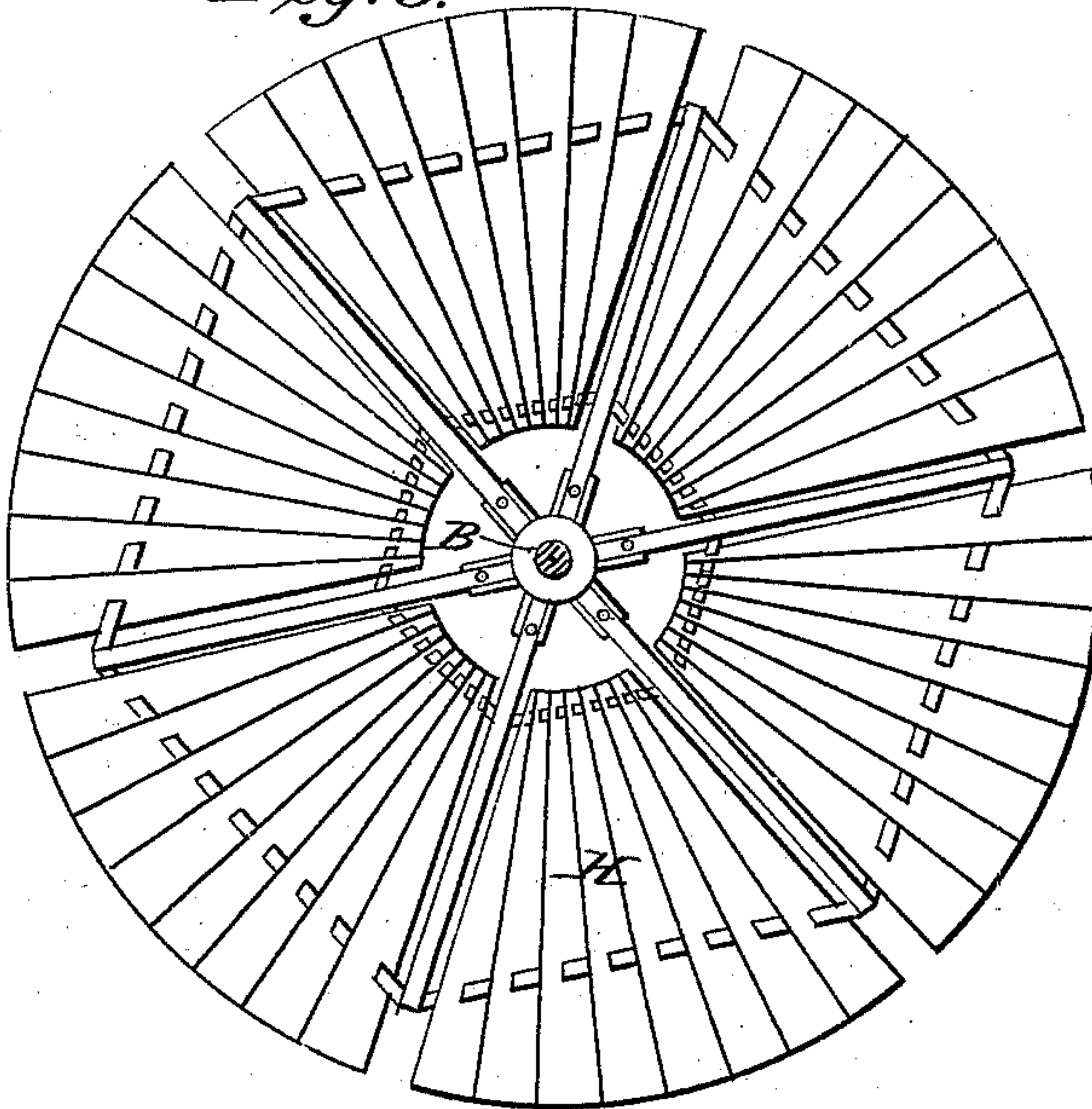
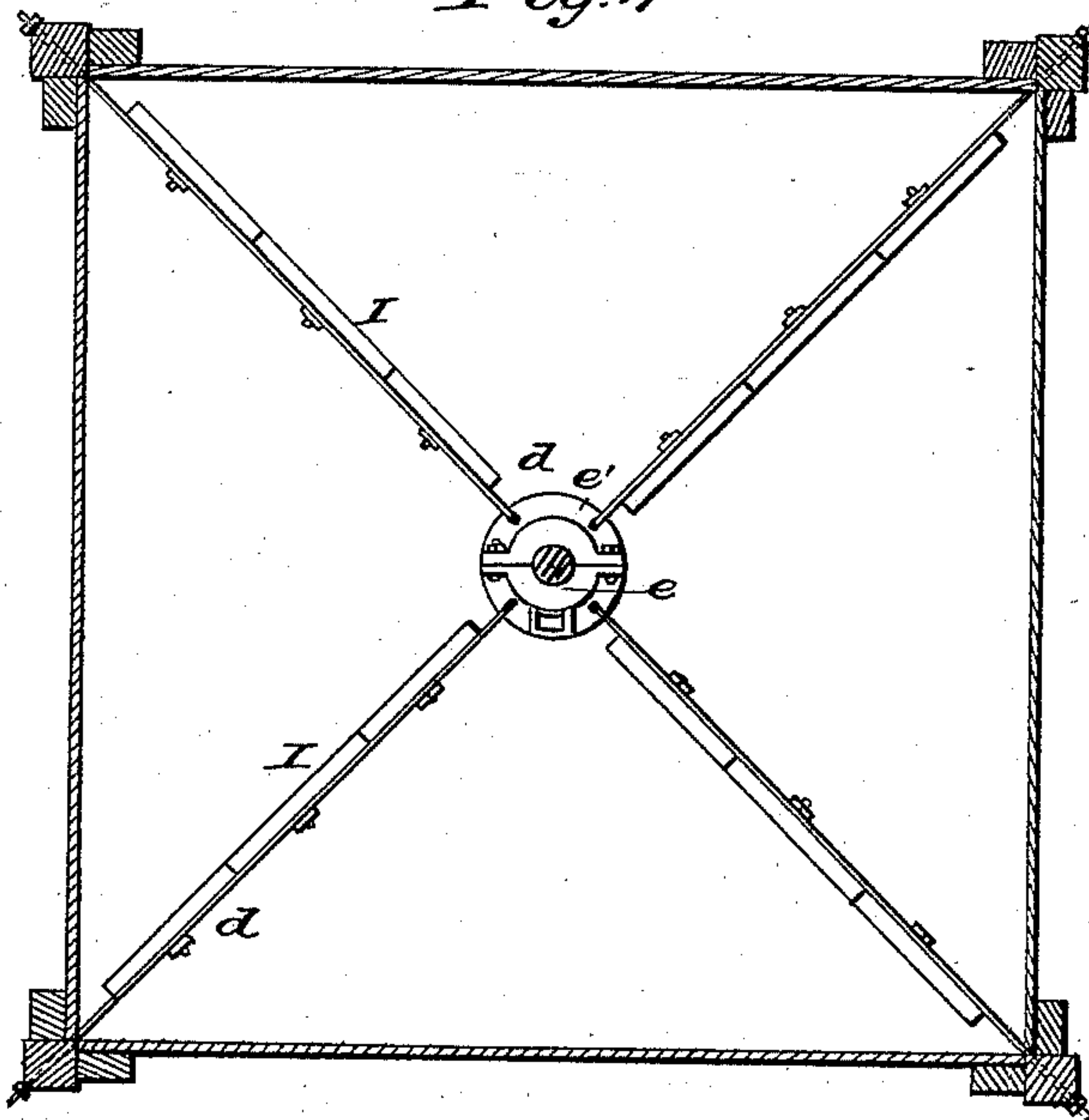


Fig. 4.



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# UNITED STATES PATENT OFFICE.

OTTO A. BENKENDORF, OF WILMOT, KANSAS.

## AIR-DRAFT ENGINE.

SPECIFICATION forming part of Letters Patent No. 395,418, dated January 1, 1889.

Application filed January 28, 1888. Serial No. 262,247. (No model.)

*To all whom it may concern:*

Be it known that I, OTTO A. BENKENDORF, of Wilmot, in the county of Cowley and State of Kansas, have invented a new and useful  
5 Improvement in Air-Draft Engines, of which the following is a specification.

My invention is in the nature of an engine or motor designed to utilize the power of ascending currents of air rising from convec-  
10 tion; and to this end it consists in the peculiar construction and arrangement of wheels and air-guides upon a vertical rotary shaft, as will be hereinafter fully described.

Figure 1 is a perspective view of the lower  
15 part of the air-flue and gears. Fig. 2 is an interior view of the air-flue, showing the arrangement of the wind-wheels, shaft, shaft-bearings, air-guides, and regulator. Fig. 3 is a plan view of one of the wind-wheels. Fig. 4  
20 is a cross-section of the air-flue just above one of the air-guides. Fig. 5 represents details of the shaft-bearing and the stay-rod for holding it. Fig. 6 is a perspective view of the top of the air-flue.

25 In the drawings, A represents a vertical air-flue, which, as shown, is constructed of a well-braced frame-work cased in to form a smooth uninterrupted draft within. Instead of making this flue of wood it may be made of sheet-  
30 iron, brick, or any other material. This flue should extend a considerable distance up into the air—say, for instance, fifty feet. Within the same is arranged in bearings the vertical shaft B, which at its lower end is stepped in  
35 a bearing, c. To the lower end of this shaft is rigidly fixed a bevel gear-wheel, C, which engages another bevel gear-wheel, D, at right angles to it, which bevel-gear D is fixed upon a horizontal shaft, E, carrying a band-pulley,  
40 F, from which latter the power is transmitted by a belt to the point of utilization.

The shaft B extends a suitable distance up the air-flue—say twenty feet or more—and is provided at regular intervals with horizontal  
45 wind-wheels H. These wheels are constructed, in any desired manner, with inclined blades, as shown, for instance, in Fig. 3, and the air in rising in the flue strikes against these inclined blades and imparts the rotary motion  
50 to the shaft, which turns the gears below. Between the wind-wheels within the flue are ar-

ranged the air-guides I. These are fixed in a stationary manner in the flue and in vertical position, and serve to prevent the air-currents from turning spirally in the flue, and thus  
55 compelling the air to strike fairly against and turn the wind-wheels. These guides are formed of vertical slats attached to stay-rods  $d d'$ . The lower set of stay-rods,  $d'$ , are fastened to a ring,  $f$ , that encircles the shaft, and  
60 the upper set of stay-rods,  $d$ , are fastened to the bearings  $e e'$  for the shaft, and when these stay-rods are tightened up by means of the nuts at their outer ends the shaft-bearing is held in position and adjusted under tension.  
65 By this construction very small light metal rods  $d d'$  are used, which do not obstruct the upward air-currents, as would the heavy cross-timbers.

The bearings for the shaft are made in two  
70 sections,  $e e'$ , bolted together around the shaft. These sections are formed with a lip or flange provided with holes  $e^5$ , into which are hooked the inner ends of the stay-rods  $d$ . One of the sections,  $e$ , of the bearing is formed with an  
75 oil-receptacle,  $e^2$ , which, through a channel,  $e^3$ , communicates with the inner periphery of the bearing which is in contact with the shaft.

At the bottom of the air-flue is arranged the draft-regulator, which consists of a series of  
80 horizontal slats or dampers, G, loosely pivoted between vertical partitions  $G'$ , and having outside the flue-casing crank-arms  $G^2$ , which are connected to a bar,  $G^6$ , and which bar  $G^6$  is in turn connected to a rod,  $G^3$ , which is at-  
85 tached to a screw-nut traveling on screw-shaft  $G^4$ , bearing hand wheel or crank  $G^5$ . By turning this screw-shaft it will be seen that the dampers are opened or closed more or less, as may be desired. The object of the parti-  
90 tions  $G'$  is to cause the air-currents, which rise through the dampers, to ascend vertically and thus counteract the tendency of the currents to pass to one side, which is liable to occur when the dampers are only partly  
95 open and in an inclined position.

To facilitate the inspection of the shaft and the oiling of its journals a set of steps or ladder-rungs,  $a$ , are attached to the outside of the air-flue, and doors  $b$  are provided in the cas-  
100 ing along its height to give access to the interior.

The device thus described can be set up anywhere, and will run so as to furnish a considerable power without any cost other than that of first construction and the wear and tear of machinery. The upward draft may be stimulated by heat from below or by a ventilating-cowl on the top of the flue; but I find that under ordinary conditions the variation in temperature between the air in the flue and that outside is sufficient alone to produce a very considerable draft of air adapted to furnish a power for many useful purposes. By painting the flue black, so as to absorb the sun's rays, the efficacy of the flue may be increased.

Having thus described my invention, what I claim as new is—

The combination, with the upright air-flue and revolving shaft bearing horizontal wind-wheels, of the bearings for said shaft, tension-rods  $d$   $d'$ , connecting said bearings to the sides of the flue, and wind-guides I, connected to and supported by said tension-rods, substantially as and for the purpose described.

The above specification of my invention signed by me in the presence of two subscribing witnesses.

OTTO A. BENKENDORF.

Witnesses:

EDWD. W. BYRN,  
SOLON C. KEMON.