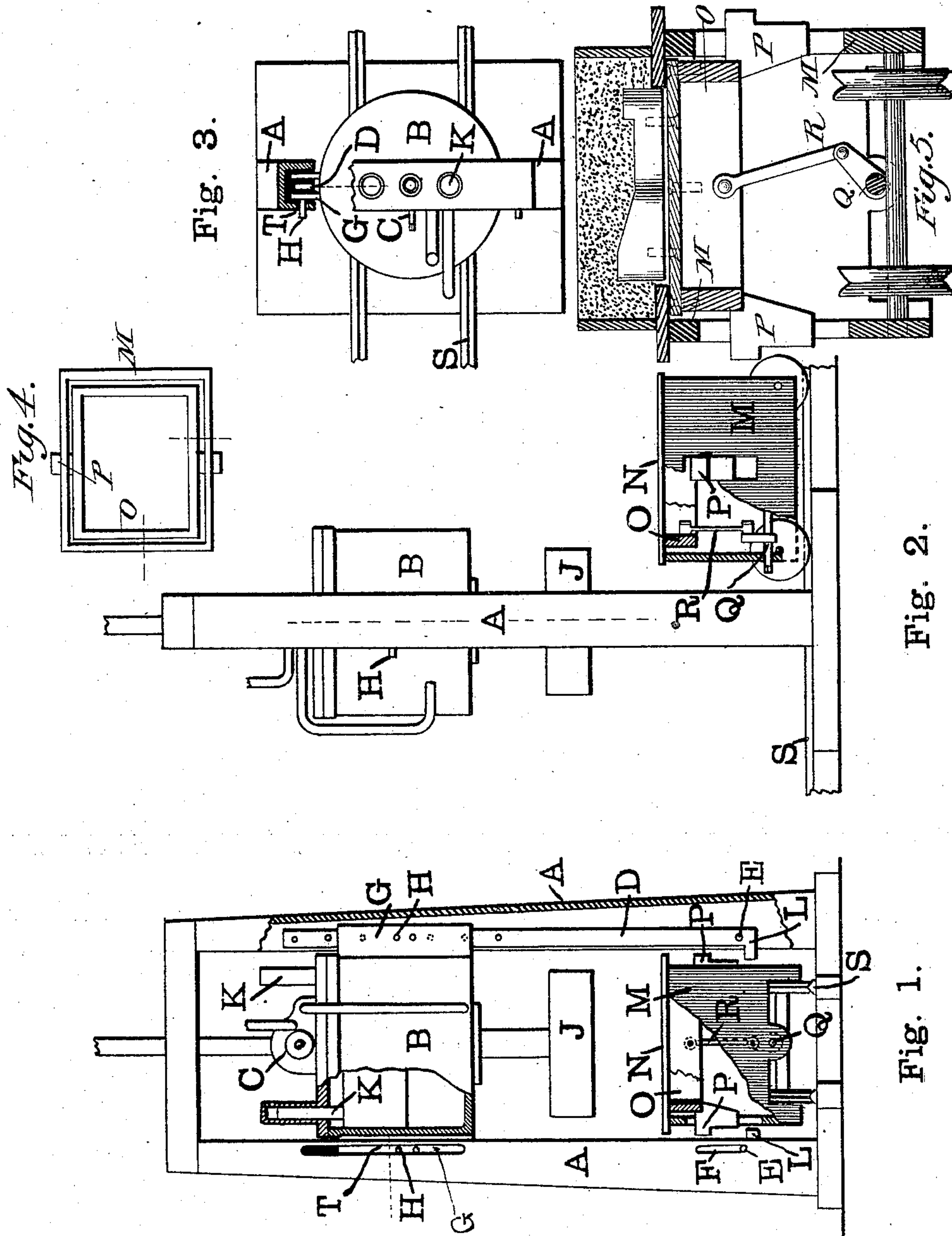


(No Model.)

H. TABOR.  
SAND MOLDING MACHINE.

No. 365,709.

Patented June 28, 1887.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

HARRIS TABOR, OF NEW YORK, N. Y., ASSIGNOR TO THE TABOR MANUFACTURING COMPANY, OF SAME PLACE.

## SAND-MOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 365,709, dated June 28, 1887.

Application filed September 22, 1886. Serial No. 214,228. (No model.)

*To all whom it may concern:*

Be it known that I, HARRIS TABOR, of New York, New York county, New York, have invented certain new and useful Improvements in Metal-Founding Machines, of which the following is a specification.

This invention pertains to that class of machinery employed by the metal-founder in the formation of sand molds.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of a machine illustrating my improvements, portions being broken away in order to exhibit interior details, the table-car being shown in position under the rammer of the machine; Fig. 2, a side elevation of the machine with the table-car moved to one side, portions of the table-car being broken away in order to exhibit the interior; Fig. 3, a plan of the machine without the table-car, one of the columns of the machine being shown in horizontal section; Fig. 4, a plan of the table-car, minus its wheels; and Fig. 5, a central vertical section of the table-car in a plane parallel with the wheel-axes of the same, showing flask, pattern, &c., in position in connection with stripper-plate.

In the drawings, A indicates a pair of rigid upright hollow columns, the inner faces of the columns being open, these columns having their bases rigidly secured to a sole-plate and their tops surmounted by a lintel, the whole forming a rigid upright frame.

B is a cylinder like the cylinder of a steam-engine, disposed vertically in the upper portion of the frame and intended to have its piston operated by means of compressed air, steam, water, or other pressure medium.

C is the valve of the cylinder, by which the movement of the piston is controlled, this valve not differing materially in construction or mode of operation from the valves of steam-engines, the function of the valve being, when manipulated, to control the admission and exhaust of steam from either end of the cylinder, and thereby cause the piston to move forcibly in either direction.

D represents strain-bars of wrought metal

arranged vertically within the frame columns, a bar in each column.

E is a transverse pin fixed in the lower end of each strain-bar and projecting horizontally therefrom.

F represents vertical slots in the base of the columns, through which these pins project, the pins normally resting in the lower ends of the slots, and thereby supporting the weight of the bars and the parts which are supported by the bars, the slots permitting a vertical movement of the bars within the limits of the length of the slots.

G represents longitudinal wings formed upon and projecting from the sides of the cylinder into the hollows of the columns, where they are fitted to slide, the cylinder thus being arranged for a vertical movement guided by the columns, the wings being slotted vertically to engage the strain-bars.

H is a removable pin at each side of the cylinder, inserted through holes in the wings of the cylinder, and engaging any chosen one of a vertical series of holes in the upper portion of the strain-bars, these pins being manipulated through vertical slots in the columns.

J is a rammer upon the piston-rod of the cylinder, this rammer being intended to operate upon the sand in the flask, the piston being square or round, according to the shape of flask to be operated upon.

K represents guide-studs projecting rigidly from the upper surface of the piston into guide-tubes projecting above the upper cylinder-head, the office of these studs being to prevent the twisting of the piston and rammer.

L represents inwardly-projecting hooks formed upon the lower ends of the strain-bars.

M is a wheeled table-car adapted to sustain the flask and to be run in between the columns under the rammers.

N is a removable flat top plate to the car, to serve as the flask-supporting table in certain cases.

O is a table-frame disposed within the table-car at the top thereof, and fitted for vertical movement therein.

P represents lugs formed upon the table-frame and projecting outward through openings in the sides of the car in a position to be



engaged by the hooks of the strain-bars when the strain-bars move upward, these lugs fitting within the openings through which they project, so as to be guided thereby, and thus forming guides for the vertically-moving table-frame.

Q is a crank-shaft journaled in the table car and adapted to be rotated by a wrench or lever, or otherwise by hand; R, connecting-rods reaching from the cranks of this shaft upward and into engagement with the table-frame, whereby a partial rotation of the crank-shaft will serve to give vertical movement to the table-frame.

S represents tracks for the table-car, extending frontwardly and rearwardly and through between the columns of the machine; and T the slots in the upper portions of the columns through which the pins H are manipulated.

The cylinder is of course to be provided with proper pipes for the bringing and carrying away of steam and other pressure medium, precisely as in case of a steam-engine, except that as the cylinder in the present case has a certain vertical movement such pipes must be arranged to permit it, as by means of flexible sections or joints, or telescopic joints, or other suitable and common means. If steam be admitted under the piston, the rammer will rise.

If steam be admitted above the piston, the rammer will move downward. The rammer may thus be caused to exert a steady downward pressure or to strike impactive blows, as desired. In practice a single downward movement is given to the rammer, the desire being, preferably, to employ it simply as a pressing-ram. It is obvious that the cylinder, with its rammer, is supported by the pins H engaging the upper portion of the strain-bars, and that the strain-bars are supported by the pins E resting in the lower ends of the slots F. Thus the entire weight of the strain-bars and cylinder apparatus is sustained in certain definite positions by the pins E. The cylinder may be adjusted higher or lower upon the strain-bars by inserting the pins H in chosen holes in the upper ends of the frame-bars.

The operation under one system of procedure is as follows: The table-car being run out upon its track in a convenient position for what is to be then done, the usual follow-board is laid upon the top plate, face upward, of the car, the pattern laid in the usual manner upon the follow-board, and the flask placed in position upon the follow-board and filled with sand by shoveling, or by appropriate sand-handling mechanism. The car bearing the filled flask is then run into the machine immediately below the rammer, the cylinder having been previously adjusted to such a height upon the strain-bars as will suit the depths of the flask in hand. In other words, a higher flask requires that the cylinder be adjusted higher up upon the straining-bars. At the time the car, with its load, is run into the machine the rammer will be sustained at the up-

per end of its stroke, steam having been admitted below the piston. When the car, with its flask, is in position, the cylinder-valve is manipulated and the rammer moves forcibly downward upon the sand, thus at one stroke completing the ramming operation. The rammer is then moved upward again and the car moved outward on its track, after which the flask may be turned over and the follow-board and pattern removed in the usual manner. In practice two table-cars are used, so that one flask is being filled with sand while the operations subsequent to ramming are being performed upon another flask, whereby one ramming-machine serves two gangs of molders. When the downward motion is given to the rammer, its first effect, after reaching the sand, was not to compress that sand with a force due to the pressure upon the piston, but simply with a pressure due to the weight of the rammer parts. When the resistance of the sand prevented the further descent of the rammer under the conditions mentioned, the rammer remained for an instant stationary, and the pressure within the cylinder then served to lift the cylinder, and with it the strain-bars, until the hooks upon the strain-bars engaged the lugs projecting outward from the car. This engagement of hooks and lugs prevents further ascent of the cylinder, and the entire pressure upon the piston then caused the further powerful downward-pressing movement of the rammer upon the sand. When the pressure was removed from the top of the piston and admitted below it, the first effect was for the cylinder and strain-bars to settle downward as far as the pins E would permit, after which the piston and rammer rose. It will be noticed that tremendous weight of the piston action imposed no vertical strains whatever upon the columns, or upon the car-track, or car-wheels, or upon the lower part of the car, all of these strains being met in direct tension by the strain-bars.

Thus far in describing the operation no reference has been made to the vertical movement of the table-frame O or the lugs P, and in the operation of molding as thus described the table-frame O performs no office and is not needed, and the lugs P perform only the office of serving to engage the car with the hooks of the straining-bars, and in the performance of other offices in this manner they may, if desired, be considered or constructed as lugs rigidly projecting from the table-car.

I have shown the rammer J as presenting a plain pressing-surface; but, if desired, and preferably, the ramming-surface will be arranged after the manner described in my patent No. 347,447, or in the manner described in my patent application now pending, bearing the Serial No. 189,569, the object of such arrangement of the ramming-surface being to provide for the more equable pressure over different portions of the sand.

In the advanced state of the art of mold-



making by machinery it is common to fix the patterns firmly upon a follow-board and to lay a silhouette-like stripping-plate upon the follow-board, the stripping-plate becoming the sand-receiving surface of the follow-board and serving to hold back the sand when the patterns are drawn. These arrangements are well understood in the art, and no description is called for here.

10 My machine is arranged for operation with stripping-plates. When operating the stripping plates, the table top N is removed and laid aside. The stripping-plate is laid upon and secured, if desired, to the frame-like top  
15 of the table-car M. The plate to which the patterns are secured is laid upon and, if desired, secured to the top of the table-frame O, it being understood, of course, that the stripping-plate is large enough to rest upon the  
20 car-frame, and that the pattern-plate is small enough to rest upon the table-frame O within the car-frame. The arrangement will be readily understood from Fig. 5 of the drawings. In this condition, with the table-frame O in its  
25 upward position in the car, the flask is placed over the patterns and filled as before, and the ramming takes place as before. After the ramming is done, and before or after the car is withdrawn from the machine, the crank-  
30 shaft Q is rotated, this causing the descent of the table-frame with the patterns, leaving the flask and sand supported by the stripper-plate, from whence it may be lifted when desired.

35 If the car is to be used for molding by the process first described, the normal open distance between the lugs P and lugs L need only be sufficient to permit the car to be run into place without interference, while, if it is  
40 desired to provide for the drawing of patterns through stripper-plates while the car is under the rammer, the normal open distance between lugs and hooks must equal at least the amount of descent of the table-frame required for the  
45 drawing of the patterns.

I claim as my invention—

1. In a molding-machine, the combination of a frame, a flask-supporting table arranged to be disposed in the lower portion of the frame,  
50 a cylinder with a piston and rammer disposed in the upper portion of the frame, said cylinder being adjustable vertically in said frame, and vertically-adjustable supports engaging said cylinder and frame and arranged to support the  
55 cylinder in chosen positions of vertical height upon the frame, substantially as and for the purpose set forth.

2. In a molding-machine, a pair of upright columns, a vertical strain-bar at each column,  
60 provided each with a hook at its lower end, a cylinder engaging the upper portion of the columns and arranged for vertical movement therein and secured to the upper ends of the strain-bars, supports to limit the descent of  
65 the strain-bars and cylinder, a rammer upon the piston-rod of the cylinder below the cylin-

der, a flask-supporting table disposed between the columns below the cylinder, and lugs projecting from said flask-receiving table into a position to be engaged by the hooks upon the  
70 strain-bars as the strain-bars rise, combined and arranged to operate substantially as set forth.

3. In a molding-machine, a pair of hollow upright columns with their inner faces open,  
75 a strain-bar disposed in each column and provided each with a hook at its lower end and with a support to limit its downward motion, a cylinder provided with wings arranged to be guided by the columns and to be secured  
80 to the strain-bars, a rammer upon the piston-rod below the cylinder, a flask-receiving table disposed between the columns below the rammer, and lugs projecting from said flask-receiving table in position to be engaged by the  
85 hooks of the strain-bars, combined and arranged to operate substantially as set forth.

4. In a molding-machine, a cylinder provided with a piston, a rammer upon the piston-rod, guide-studs rigidly secured to the piston,  
90 and guide-tubes engaging said studs, such guide-tubes having their upper ends closed and being rigidly secured in the cylinder-head, combined and arranged to operate substantially as set forth.

5. In a molding-machine, a frame, a cylinder supported in the upper portion of the frame and fitted for vertical movement therein and provided with a piston and rammer, strain-bars connected with said cylinder and projecting downwardly therefrom into engagement with a support adapted to limit their descent and provided with hooks, and a flask-receiving table-car provided with lugs arranged to pass above said hooks and to be engaged thereby as the strain-bars rise, combined and arranged to operate substantially as set forth.

6. In a molding-machine, a frame, a cylinder supported in the upper part thereof and arranged for vertical motion therein, strain-bars provided with hooks at their lower ends and reaching downward from said cylinder, a rammer upon the piston-rod of the cylinder below the cylinder, a table-car arranged to be placed below the rammer, a table-frame disposed within the upper portion of the table-car and adapted for vertical motion therein, lugs projecting from said table-frame into position to be engaged by the hooks of the strain-bars as the strain-bars rise, and mechanism, substantially as described, for raising and lowering the table-frame within the table-car, combined and arranged to operate substantially as set forth.

7. In a molding-machine, two columns, A, provided with slots F at their bases, strain-bars D, disposed within the columns and provided with hooks L and pins E, cylinder B, having wings G engaging the columns, pins H, securing the cylinder to the strain-bars, rammer J, attached to the piston-rod below



the cylinder-track S between the columns, and table-car M, provided with lugs P, combined and arranged to operate substantially as set forth.

- 5 8. In a molding-machine, a table car, M, table-frame O, disposed in the upper portion thereof and arranged for vertical motion therein, mechanism, substantially as described, for raising and lowering the table-frame in the table-car, and removable table-top N, disposed over the table-car and table-frame, combined and arranged to operate substantially as set forth.

9. In a molding-machine, a vertically-movable cylinder provided with a rammer and with 15 hooks, a support to limit the descent of such cylinder, and a movable work-supporting table provided with lugs arranged to be engaged by said hooks as the cylinder rises, combined and arranged to operate substantially as and for 20 the purpose set forth.

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