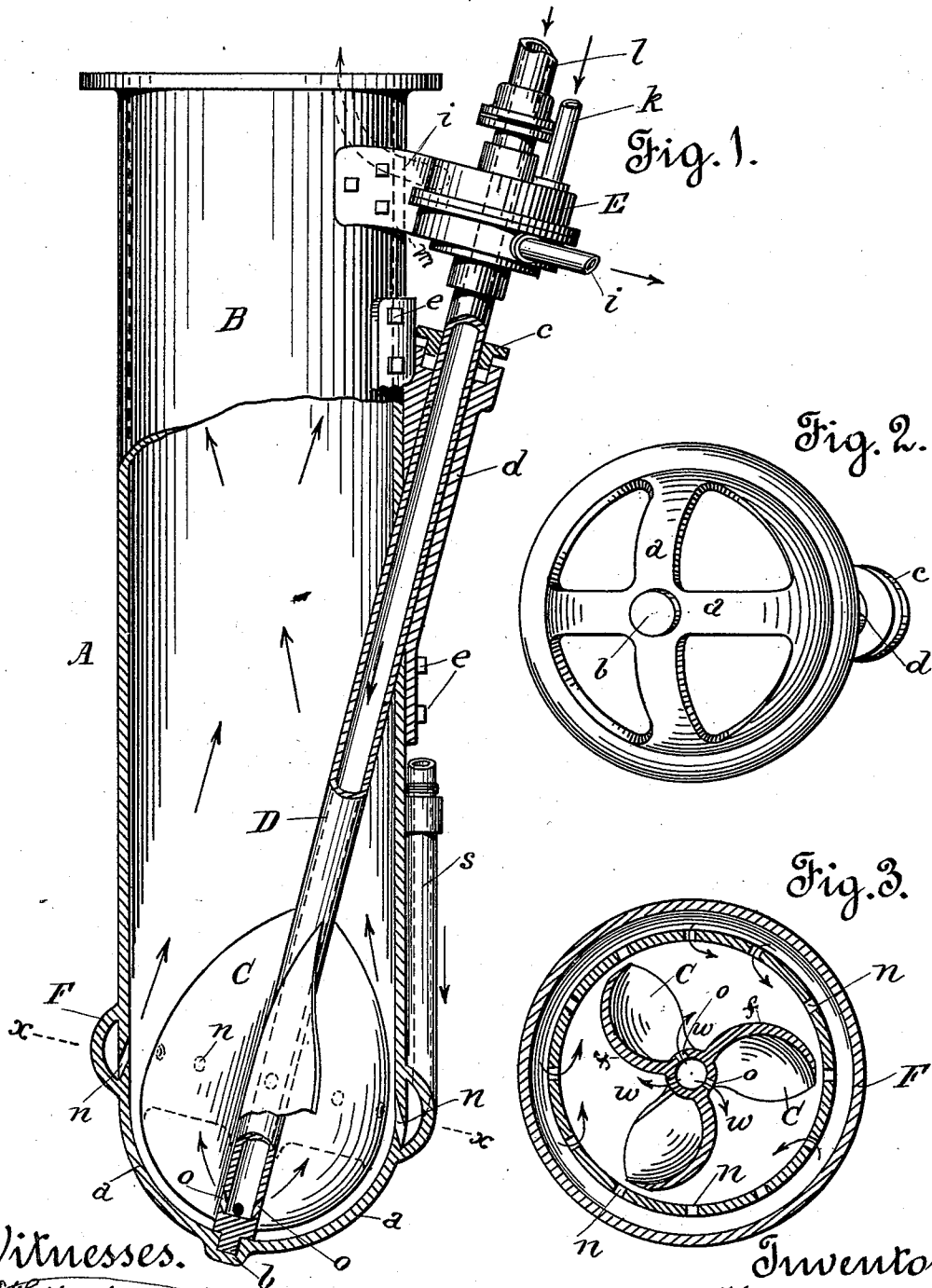


H. P. HOLLAND.
EXCAVATOR AND ELEVATOR.

No. 521,883.

Patented June 26, 1894.



Witnesses.

H. Houtenwerde.

Norman Hurd.

Inventor.

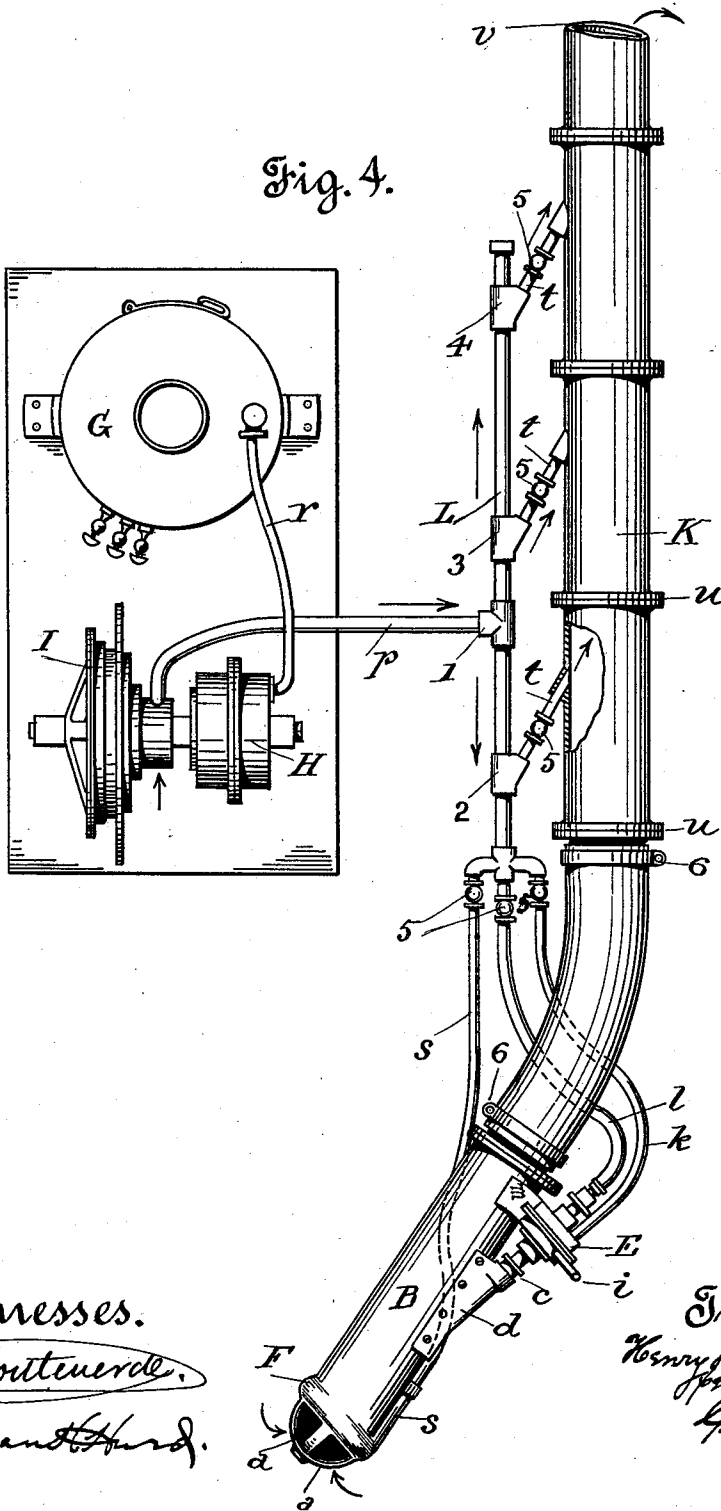
Henry P. Holland
Perkins Attorney
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Fig. 4.



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H. Moutenierde.
Norman Hurd.

Inventor.
Henry P. Holland
per his Attorney
C. W. Spricer

UNITED STATES PATENT OFFICE.

HENRY P. HOLLAND, OF SAN FRANCISCO, CALIFORNIA.

EXCAVATOR AND ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 521,883, dated June 26, 1894.

Application filed September 1, 1893. Serial No. 484,571. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. HOLLAND, of San Francisco, county of San Francisco, and State of California, have invented a certain new and useful Improvement in Excavators and Elevators, the same being a combined pneumatic excavator and elevator, of which the following is a specification.

My invention relates to a combined pneumatic excavator and elevator, by means of which bodies of sand, mud, grain, gravel, guano, or loose fine material may be easily handled, and moved with great rapidity; compressed air or water being the lifting or moving power employed for forcing and carrying the material forward through pipes or conduits with great velocity. The material to be moved, or excavated as it comes in contact with the open lower end of the header, is caught up by an auger shaped twirler, which revolves on the inside of the header casing which is operated by a small rotary engine attached to the upper end of the twirler shaft mounted on the outside of the header casing, and the sand, mud, grain or other material entering the lower end of the twirler is carried by its revolutions, and the force of compressed air and water, up through the winding grooves of the twirler to the upper end of the header, and then on up the elevating pipe or conduit to which the header is attached by the force of the said compressed air or water, in a continuous whirling movement to the discharge end of the elevating pipe. The whirl given to the material by the twirler, as it enters the header, tends to throw the material mostly toward the center, so that the outside of the moving mass is light and thin, and the entire body is enveloped in compressed air. The material or substance operated upon is made to move in one continuous flow or current, in volume according to the size and capacity of the pipes, or conduits employed, to the place of discharge. The rapid movement of the substance or material through said pipes, or conduits, will continue so long as the air, or water is applied or acts upon it. So great is the power and rapidity of movement of the compressed air or water acting upon the sand, mud, or other material to be moved, that large bodies of sand, or other material can be raised and transferred

to a distance in a short space of time, accomplishing said removal with a rapidity far surpassing any other methods now employed. 55

The combined pneumatic excavator and elevator may be operated by compressed air, steam, or water under pressure.

I attain the objects of my invention by the mechanism illustrated in the accompanying drawings, in which— 60

Figure 1,— is a vertical elevation of header, partly broken; Fig. 2,— a bottom plan of header; Fig. 3,— a plan of bottom section through *x. x.* on Fig. 1; Fig. 4,— a diagram- 65 matical plan showing the general arrangements of combined pneumatic, excavating and elevating machine.

Similar letters and figures refer to the similar parts throughout the several views. 70

A. is the excavating header attached at its upper end to the lower end of the elevating tube;—B. the casing inclosing the twirler;—C. the twirler on the end of the hollow shaft D. for loosening and gathering into the end 75 of the header the material to be elevated, the lower end of which is mounted in the meeting ends of the guards *a. a.* in socket *b.*, and the upper end of said shaft in mounting piece *d.* having the boxing *c.* and bolted upon the casing by bolts *e. e* passing through mounting piece *d.* and the casing to which it is attached. 80

E. is a small rotary engine that operates the twirler.

i. i. are discharge escapes for small rotary 85 engine; *k.* air or water pipe supplying small rotary engine with power from rotary air compressor; *l.* air or water pipe conducting compressed air or water into the hollow shaft of the twirler to discharges *o. o.* at the end of the shaft just back of the lips of the twirler, 90 to prevent any suction that might be created by its rapid motion; F. air or water receiver into which compressed air or water is forced from the air compressor, *n. n.* discharge escapes, for discharging compressed air or water 95 from the receiver, up the header leading to the elevating tube; G. boiler supplying steam; H. rotary steam engine operating the compressor; I. air compressor; K. elevating tube through which the material sand, grain or other material operated upon by the twirler is forced to the discharge at the end of the elevating tube; L. main compressed air or 100

water pipe connected with the air compressor by supply-pipe; *p.* supply pipe for compressed air or water; *r.* pipe conducting steam from the boiler to the engine; *s.* air or water conducting compressed air or water from main air or water pipe to the receiver, near the lower end of the header from which compressed air or water is forced into the header through discharges *n. n.* for forcing the material being elevated up the elevating tube, *t. t.* air or water pipes connecting main air or water pipes with the elevating tube for forcing additional supply of compressed air or water, into the tube, to aid in carrying forward the material being forced through it; *u.* connecting joint uniting header and elevating tube, *v.* discharge end of elevating tube, *w. w.* grooves between the flanges of the twirler through and up which the excavated material passes toward elevating tube; 1, 2, 3, 4, couplings, 5 valves to govern air or water; 6. 6. clamps on elevating tube.

The header may be made flexible or rigid, and may be placed for use on a small two wheeled truck, so that it may be easily moved about to reach and accommodate itself to the material to be excavated or operated upon, or it may be handled by a tackle, or crane, as when used for removing mud under water, as the header can be used and worked under water, as well as on land, by compressed air, water or steam.

Coal, saw dust, and such like fuel can be forced into the fire pits, or furnaces under boilers, transferring it rapidly and easily from the place of storage, to feed the fires.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A combined pneumatic excavator and elevator consisting of elevating tube *K.*, the header *A.*, attached to the lower end of the elevating tube having the auger shaped twirler *C.* on the hollow shaft *D.* for loosening and drawing into the end of the header such material as it may come in contact with, the casing *B.* surrounding the twirler, through the upper side of which the twirler shaft passes, and is mounted upon the outside; the small rotary engine *E.* on upper end of said shaft mounted upon said casing as a bed piece; the discharge escape *i.*; the mounting piece *m.* for said rotary engine; the mounting piece *d.* for twirler shaft, the boxing *c.*, the socket *b.* in which the lower end of twirler shaft revolves; the compressed air or water receiver *F.*, the air or water escape *n. n.* for forcing compressed air or water up the header for carrying the material acted upon by the twirler forward, on and through the elevating tube, the compressed air or water discharges *o. o.* on the inside of the end of hollow shaft just back of the lips of the twirler, through which compressed air or water may be forced to prevent suction, the lips of the twirler *f. f.*, the grooves *w. w.* through which the material being elevated passes up the header, the guards *a. a.*, the air or water pipe

p. for conveying compressed air or water to the main air or water pipe, the main air or water supply pipe, *L.*; the pipe *s.* attached to main air or water pipe through which compressed air or water may be forced into the receiver; the pipe *l.* attached to main air or water pipe for conveying compressed air or water to the hollow shaft, and through which it passes to the discharges near end of the shaft, the pipe *k.* through which compressed air or water is conveyed for operating the small rotary engine on the end of the twirler shaft, the pipes *t. t.* through which additional compressed air or water is forced into the elevating tube, to aid in elevating the material passing through said tube, the discharge *v.*, the connecting joint *u.*, the couplings 1, 2, 3, 4, the valves 5. 5., for governing the admission of the compressed air or water, and the clamps 6, substantially as herein described and set forth.

2. In a combined pneumatic excavator and elevator, the elevating tube, *K.*, having discharge, *v.*, through which sand or other loose or fine material may be forced by compressed air or water, combined with the header, *A.*; the air or water supply pipe, *p.*; the main compressed air or water pipe, *I.*; the pipe, *s.*, conveying compressed air or water to the receiver on the lower end of the header; the receiver, *F.*; the air or water discharges, *n. n.*; the pipe, *l.*, supplying compressed air or water to the hollow shaft through which it is conducted to the discharges near end of said shaft; the pipe, *k.*, through which compressed air or water is conveyed for operating the small rotary engine on the end of the twirler shaft in casing, *B.*; the small rotary engine, *E.*, mounted on header casing for operating the twirler; the discharge escape, *i.*; the mounting piece, *m.*, on said casing for mounting said rotary engine; the twirler shaft, *D.*; the mounting piece, *d.*; the twirler, *C.*; the boxing, *c.*; the air or water discharges, *o. o.*; the grooves, *w. w.*; the lips, *f. f.*; the guards, *a. a.*; the socket, *b.*; the pipes, *t. t.*, through which compressed air or water is forced into the elevating tube furnishing additional elevating power; the connecting joint, *u.*; the couplings, 1, 2, 3, 4; the valves, 5. 5.; substantially and for the purposes herein described and set forth.

3. In a combined pneumatic excavator and elevator, the combination of the air or water supply pipe, *p.*, attached to an air compressor for conveying compressed air or water to the main air or water pipe; the main air or water supply pipe, *L.*; the pipes, *s.*, *l.* and *k.*, supplying compressed air or water to the receiver, to the hollow shaft of the twirler, and to the small rotary engine; with the header, *A.*; the small rotary engine, *E.*, mounted upon the header casing, for operating the twirler in the header; the mounting piece, *m.*; the discharge escape, *i.*; the hollow shaft, *D.*; the mounting piece, *d.*; the boxing, *c.*; the twirler, *C.*; the casing *B.*; the air or water receiver, *F.*, surrounding the lower end of the casing; the air

or water discharges, *n n*, on the receiver for operating the material to be elevated; the grooves *W, W*; the lips, *ff*; the guards, *a a*; the socket, *b*, forming the center where said guards meet, and in which the end of the twirler shaft revolves; the air or water discharges, *o o*, at the end of the shaft back of the lips of the twirler to prevent suction; the pipes, *tt*, through which compressed air or water is forced into the elevating tube, furnishing additional elevating power; the elevating tube, *K*; the discharge, *v*; the connecting joint, *u*; the couplings, 1 2 3 4; the valves, 5 5, for governing the admission of compressed air or water to connecting pipes, substantially and for the purposes herein described and set forth.

4. In a combined pneumatic excavator and elevator, the combination of the twirler, *C*; the lips of the twirler, *ff*; the grooves, *ww*; the guards, *a a*; the hollow shaft, *D*, carrying said twirler at its lower end, its upper part passing through and mounted upon said casing; the socket, *b*, in which the end of the twirler shaft revolves; the casing, *B*, inclosing the twirler and the lower portion of said shaft; the air and water discharges, *o o*, on inside of the end of the hollow shaft through which compressed air or water may be forced to prevent suction, with the compressed air or water receiver, *F*; the air or water escapes, *n n*, for forcing compressed air or water up the receiver, for carrying the material acted upon by the twirler forward through the elevating tube, *K*, the small rotary engine, *E*, on the upper end of the shaft and mounted upon said casing as a bed piece; the discharge escape, *i*; the mounting piece, *m*, for said rotary engine; the mounting piece, *d*, for twirler shaft; the boxing, *c*; the elevating tube, *K*; the discharge, *v*, to elevating tube; the pipe, *s*, attached to main air and water pipe for conducting compressed air to the receiver; the pipe, *l*, attached to main air and water pipe for conducting air or water to the hollow shaft through which it passes to the discharges near end of shaft; the pipe, *k*, for conducting compressed air or water to the rotary engine on the header; the connecting joint, *u*; the couplings, 1 2 3 4; and valves, 5 5, substantially and for the purposes herein described and set forth.

5. In a combined pneumatic excavator and elevator, the combination of the small rotary engine, *E*, on the end of the twirler shaft, *D*, having discharge, *i*, and operated by compressed air or water supplied from the main air and water pipe, with the supply air and

water pipe, *p*; the main air and water pipe, *L*; the pipes, *tt*, supplying additional compressed air or water to the elevating tube; the compressed air and water pipes, *s, l* and *k*, supplying compressed air or water to the receiver, to the hollow shaft of the twirler, and to the small rotary engine; the rotary engine, *E*, for operating the twirler; the mounting piece, *m*, securing said rotary engine to the casing; the boxing, *c*; the mounting piece, *d*, supporting twirler shaft on the casing; the casing *B*; the receiver, *F*; the air or water discharges, *n n*; the twirler shaft, *D*; the twirler, *C*; the lips, *ff*; the grooves *ww*; the air and water discharges, *o o*; the guards, *a a*; the socket, *b*; the connecting joint, *u*; the couplings, 1 2 3 4; the valves, 5 5, for governing the admission of air or water to connecting pipes, and the elevating pipe, *K*, and discharge, *v*; substantially and for the purposes herein described and set forth.

6. In a combined pneumatic excavator and elevator, the combination of the hollow shaft, *D*, for conducting compressed air or water to the air and water discharges on the end of said shaft, for preventing suction of the materials operated upon by the twirler; the mounting piece, *d*; the air and water discharges, *o o*, in the end of the twirler shaft, with the twirler, *C*; the compressed air and water receiver, *F*; the discharges, *n n*, on said receiver, for forcing the material operated upon by the twirler up through the elevating tube; the lips of the twirler, *ff*; the grooves, *ww*, in the twirler through which the materials are forced and carried; the guards, *a a*, on the head of the header casing, protecting the twirler; the socket, *b*, in the center of said guard piece in which the end of the twirler shaft revolves; the rotary engine, *E*; operating the twirler; the mounting piece, *m*; the casing, *B*; the connecting joint, *u*; the discharge, *i*; the couplings, 1 2 3 4; the valves, 5 5; the pipe, *p*, conveying compressed air or water to main air and water pipe; the main compressed air or water pipe, *L*; the pipes, *s, l* and *k*, conveying compressed air or water to the receiver, to the hollow shaft, and to the rotary engine; the pipes, *t t*, conveying compressed air or water to the elevating tube; the elevating tube, *K*, through which the materials to be elevated are forced, and the discharge, *v*, substantially and for the purposes herein described and set forth.

HENRY P. HOLLAND.

Witnesses:

NORMAN H. HURD,
DOMENIO CASASSA.