(No Model.) 2 Sheets—Sheet 1.

S. R. SCHARF.

SAND OR GRAVEL DRIER.

No. 501,539. Patented July 18, 1893.

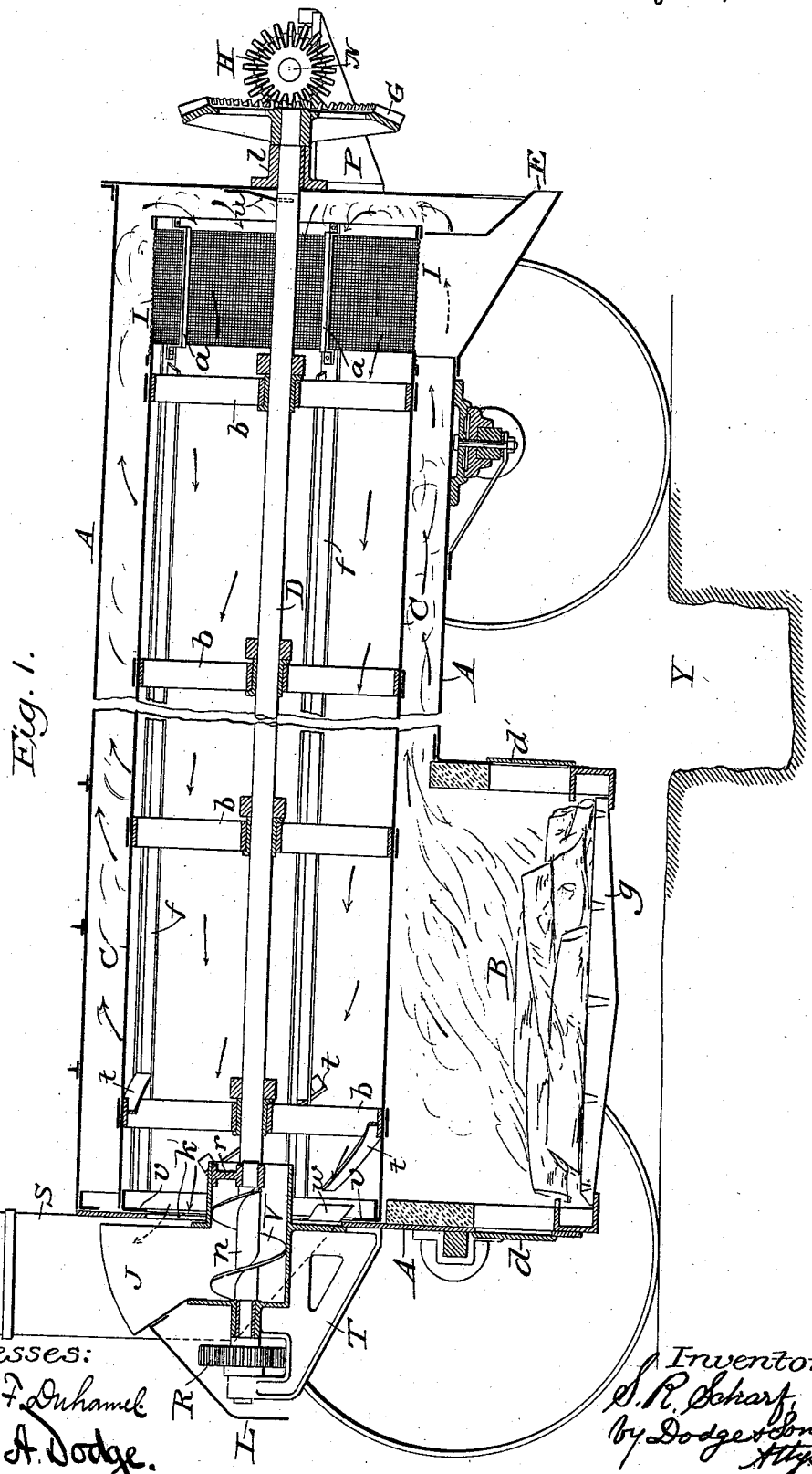


Fig. 1.

Witnesses:
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Fig. 2.

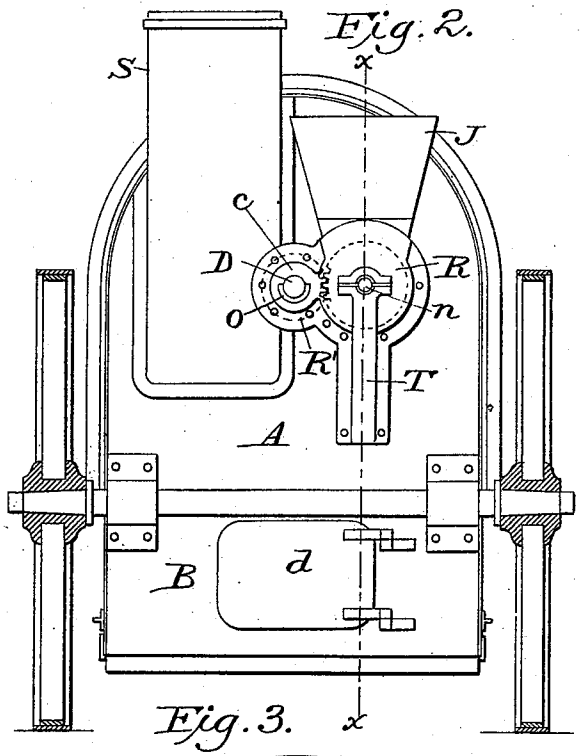
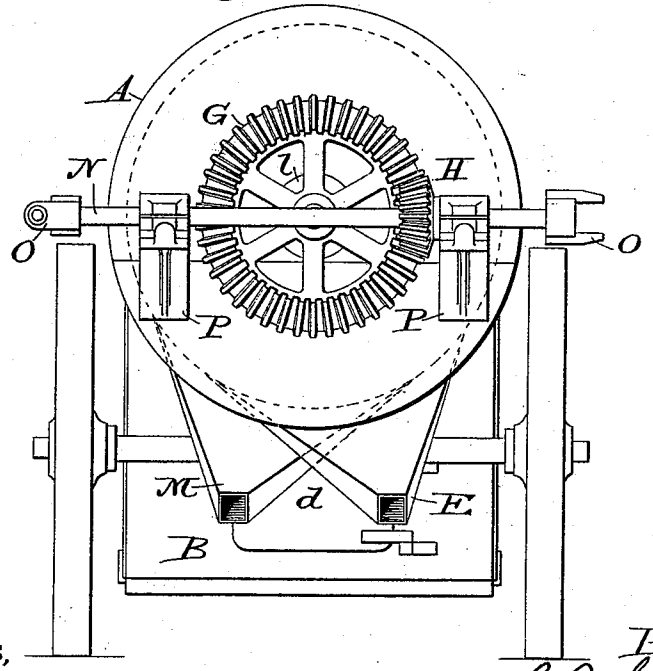


Fig. 3.



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UNITED STATES PATENT OFFICE.

SAMUEL R. SCHARF, OF WASHINGTON, DISTRICT OF COLUMBIA.

SAND OR GRAVEL DRIER.

SPECIFICATION forming part of Letters Patent No. 501,539, dated July 18, 1893.

Application filed March 8, 1892. Serial No. 424,169. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL R. SCHARF, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Machines for Drying and Separating Sand and Gravel, of which the following is a specification.

My invention relates to apparatus or machines for drying and separating sand and gravel, and the invention consists in certain novel features in the construction of the apparatus as hereinafter more fully set forth.

Figure 1 is a longitudinal vertical section on the line *x*—*x* of Fig. 1. Fig. 2 is an end elevation of one end of the apparatus with the apron for protecting the gearing removed; and Fig. 3 is an end elevation of the opposite or tail end of the same.

The object of my present invention is to produce a portable machine or apparatus by which sand and gravel can be more rapidly dried and separated than by the machines heretofore used, and by which the heat can be more fully utilized, thereby effecting a saving in fuel, it being designed more especially for use in drying and screening sand to be used in the preparation of asphalt and similar compounds for paving streets.

To construct a machine on my plan, I make the outer shell or body A of metal, of cylindrical form, with a portion of its sides extended downward to form a fire box B, which extends somewhat less than half its length, as shown in Fig. 1. The fire box is provided with grate bars *g*, and has a door *d* at the rear end, and a similar door *d'* at the front end, as shown in Fig. 1, so that the fire can be attended to from either end. The object of having two doors is that when material is being shoveled into the hopper it is often inconvenient for the fireman to occupy a position by the door at that end, in which case the fire can be attended from the opposite end of the fire box, it being the practice to dig a pit or channel in the ground in front of the door of sufficient depth to permit the fireman to stand in and perform his work.

As hereinafter explained, in practice, a number of these machines will be placed side by side, and by digging a channel as indicated at Y, Fig. 1, the fireman can pass along from one to another of the machines and attend to the fires of all without interference with persons feeding the hopper, and where the falling sand, gravel and stones will not molest or affect him in any way, and which is a very great advantage.

For a more clear understanding, I will here state that I apply the terms front and rear to this machine in the same manner that they are applied to an ordinary wagon or vehicle, the material being fed in at the rear end and delivered at the front end. This body thus constructed, I mount on wheels as shown, the axle for the rear wheels being secured to the wall of the fire box at the rear end of the machine, while the axle for the front wheels is secured to the under side of the body A a short distance from the opposite end, by means of washer plates and a king bolt, so that the front wheels can be turned to the right or left similar to those of an ordinary vehicle, to enable the machine to be moved about wherever desired, the arrangement of the axles being shown in Fig. 1.

As heretofore constructed, this class of machines have had the rear axle placed in front of the fire box, the result being that the part in rear of the axle after being heated by the fire, would droop, thus throwing the parts out of line, and causing the shaft of the rotating cylinder to bind in its bearings, and interfering with the free working of the gear and moving parts, and making an opening between the end of the cylinder and the case through which the heat and smoke would escape. By locating this axle at the rear end of the fire box as shown, I obviate these difficulties, as the sides of the fire box being vertical extensions of the sides of the body, they prevent any bending or drooping of the body in front of the axle, the part in front of the fire box being about equally balanced on the front axle, as shown. It also enables the fire box to be made longer, which is desirable where wood is used as fuel. Within this body or case I mount a cylinder C made of metal plates, and which is secured to a central shaft D by a series of arms or spiders in any suit-

able manner, this shaft having its bearing in bosses bolted fast to the ends of the shell or body, one boss *l* being shown in Fig. 1, and the other boss *c* being shown in Fig. 2. On this shaft D at one end is secured a bevel gear wheel G, which engages with a bevel pinion H secured upon a cross shaft N supported in brackets P which are also bolted to the end plate of the shell or body A, as shown in Figs. 1 and 3. This cross shaft N is provided at each end with a coupling O, by which means a series of these machines placed side by side can be coupled together, so that a gang or series of machines can all be driven from a single motor, a portable steam engine being generally used for the purpose. At its opposite end the main shaft D is provided with a pinion as shown in Fig. 2, to engage with a corresponding pinion R to operate the feed screw.

As shown in Fig. 1, longitudinal ribs or flanges *f* are secured at intervals to the inner face of the cylinder, which serve to strengthen the same and also to lift and stir up the sand and gravel while passing through the cylinder from end to end,—the delivery end of the machine being sufficiently lower than the head or end at which the material is fed in, to cause the same to work gradually along to the delivery or tail end of the cylinder as the latter is rotated. As shown in Fig. 1, the cylinder is open at its delivery end, and for a short distance the shell of the cylinder is composed of a wire screen I of the proper fineness to permit the sand to pass through the same and fall into the chute E, while the gravel and coarser material pass out at the open end of the cylinder and fall into another chute M, these two chutes being arranged as shown in Fig. 3, so as to deliver the sand and the coarser material separately. The ribs or flanges *f* do not extend across the screen, as they would interfere more or less with its operation, but instead thereof bars *a* are used, they being bent at right angles at each end and bolted fast at opposite sides of the screen, whereby these bars *a* are thrown inward away from the screen as shown in Fig. 1, thus leaving the surface of the screen entirely unobstructed throughout, and adding to its efficiency. At its head or opposite end the cylinder is also open, but is provided with an annular inturned flange *v*, as shown in Fig. 1, the outer vertical face of which is trued up in a lathe or otherwise so as to fit as closely to the end wall of the case as possible without binding or interfering with the free rotation of the cylinder, in order to prevent the heat and smoke from the fire box escaping at that point, and compelling them to take the opposite direction. An opening K is cut through the end wall of the case to which is secured a smoke pipe S as shown in Figs. 1 and 2, the result being that the heat and smoke from the fire box fills the space between the cylinder and the outer shell or case from end to end, then enters the open delivery end of the cylinder and passing back through the same, enters and escapes through the smoke pipe. By this plan of causing the heat to return through the cylinder it is utilized to a much greater extent than when permitted to escape at the opposite end as was heretofore the practice in this class of machines. On its return through the cylinder the products of combustion are brought into direct contact with the sand, which being lifted by the ribs or flanges *f* as the cylinder rotates, falls therefrom in a sheet or shower through the hot gases and smoke passing through the cylinder, thus exposing the entire surface of all the particles of sand and gravel to direct contact with the passing current of heat; and as heated air and gases have a strong affinity for moisture, the steam or moisture arising from the heated damp material is taken up and carried along with the current of heat and smoke, out through the smoke pipe.

In order to feed the sand and gravel with uniformity to the cylinder, I provide a hopper J of the form shown in Figs. 1 and 2, its lower portion being extended horizontally and made circular in cross section, with its delivery end arranged to project a short distance within the cylinder, as shown in Fig. 1. In the bottom of this hopper I place a feed screw V, the shaft *n* of which has a support bearing as at *r* at its inner end, and in a boss on the outer face of the hopper, and in the end of a bracket T beyond, the lower portion of the hopper with its boss and the bracket T all being cast in a single piece, and bolted fast to the end of the wall of the case as shown in Figs. 1 and 2.

On the shaft *n* between the boss and the bracket is secured a pinion R which engages with a corresponding pinion on the end of the cylinder shaft D which extends out through the end wall of the case at the center, the feed hopper and screw being at the side opposite the smoke pipe, as shown in Fig. 2. By this arrangement the feed screw is driven by the cylinder shaft, and that by the cross shaft N as before described.

In order to keep the material from banking up at the end of the cylinder above the edge of the flange *v*, I secure to the inside of the cylinder a series of inclined flights or plates *t* in such a position that as the cylinder is rotated they will pass successively under the mouth of the delivery tube of the hopper, and as the material falls upon them it will be thrown inward away from the end of the cylinder.

In order to prevent the sand and gravel from getting into the pinions and bearings of the main shaft and feed screw, I place over them an apron L as shown in Fig. 1, and which may either be hinged or permanently fastened to the hopper as preferred.

As is obvious, in machines of this kind, there is a constant tendency of the sand to get into the bearings, and to prevent this I secure to the inner face of the end plate at each end, directly over the shaft D, a shield *u*, Fig. 1, which has a circular notch in its lower end so as to fit over the shaft, it being inclined as shown so as to deflect any sand that may be carried up and thrown out by the rotating cylinder and its screen and prevent it from entering the bearing. The bosses which support the shaft D are made with semicircular recesses for the reception of a removable box or bearing *o*, which can be changed at pleasure by drawing it out or shoving it in endwise, an end view of the same being shown in Fig. 2. The draft through the cylinder also carries a considerable quantity of the finer sand and dust along into the smoke pipe, from whence more or less of it falls and would get between the flanged end of the cylinder and the shell, and which if not prevented, would soon grind and wear away these parts, so as to permit the heat and smoke to pass from the fire box directly up through the opening thus formed into the smoke pipe; and to prevent this, I make the bottom wall of the smoke pipe inclined as shown by the dotted line in Fig. 1 and make its lower end in the form of a chute *w*, which is made to project some distance into the open end of the cylinder, thus delivering the sand and grit some distance away from the flange within the cylinder, by which means it is effectually prevented from getting between the head of the cylinder and the adjoining wall of the case.

If at any time it is desired to change the relative speed of the feed screw and the cylinder, it can be readily done by changing the size of the pinions on the shafts D and *n*, or by transposing them.

By having sets of different sized pinions the relative speeds of the feed screw and shaft may be varied to any extent desired, thus adapting the machine to the treatment of all varieties and conditions of material whether wet or dry. This is the more important from the fact that in a machine constructed on this plan, the smoke pipe and feed hopper must both connect with the interior of the cylinder, while the shaft of the latter must occupy a central position, and hence the mouth of the feed hopper must occupy the space between the cylinder shaft, and the edge of the cylinder flange, and therefore cannot be enlarged beyond a certain point.

By these several improvements I am enabled to produce a machine that accomplishes the work in a most satisfactory manner, and with rapidity and economy.

One great advantage of this construction is, that by passing the heat and smoke back through the cylinder in which the material is constantly being lifted by the ribs and allowed to fall gradually back, the heat is brought into such direct and intimate contact with the particles that even though the sand and gravel be fed in wet, yet it is thoroughly heated and dried by the time it reaches the screen, and which of course enables the sand to be much more readily separated from the gravel and coarser material, it passing through the screen and out at the spout E, while the gravel and coarser material pass over the screen, out at the open end of the cylinder and thence through the spout M. By making the screen detachable it can be changed, and a coarser or finer one be substituted as may be desired.

I am aware that a variety of machines or apparatus have heretofore been patented in which rotating cylinders are shown in connection with furnaces, steam heat, &c., for drying or desiccating grain, offal and similar substances, but such machines are not adapted to dry and separate sand and gravel in the manner or as effectually as my machine does.

What I claim as my invention is—

1. The herein described machine for drying and separating sand and gravel, consisting of a non-rotating outer shell or body having a fire box in the lower part thereof at one end, a rotating cylinder mounted within said shell and having a screen at its delivery end, with mechanism substantially such as described for imparting motion to said cylinder, and a smoke pipe located at the same end as the fire box and connecting with the interior of the cylinder by an opening through the outer shell, the said parts being arranged to operate substantially as and for the purpose set forth.

2. The combination of the non-rotating case or body provided with a fire box and smoke pipe as shown, a rotating cylinder and screen mounted therein, with a hopper provided with a screw feed arranged to project through the closed end of the body and deliver the material within the open end of the rotating cylinder, substantially as shown and described.

3. In combination with the hopper and feed screw arranged to deliver the material into the end of the rotating cylinder, the cylinder provided with an inturned flange *v*, and a series of inclined plates or flights *t* arranged to pass under the delivery mouth of the feed hopper as the cylinder rotates and throw the material inward away from the open end of the cylinder, as set forth.

4. In a portable machine for drying and separating sand and gravel, the combination of the following elements: a shell or body having a fire box and smoke pipe secured thereto, a horizontal cylinder mounted therein and carried by a central shaft projecting at the opposite ends of said shell or body, and provided at one end with a bevel gear wheel G arranged to engage with a bevel pinion H, mounted on a cross shaft, and carrying at its opposite end a pinion, and a hopper having a feed screw in its bottom the shaft of said feed screw being provided with a pinion en-

gaging with the pinion on said cylinder shaft, the bearings for all of said movable parts being secured to the shell or body, substantially as shown and described.

5. In a sand drying machine in which the products of combustion are conducted through the rotating cylinder, a smoke pipe having its lower wall inclined and arranged to project within the cylinder, substantially as and for the purpose set forth.

In witness whereof I hereunto set my hand in the presence of two witnesses.

SAML. R. SCHARF.

Witnesses:
JAMES F. DUHAMEL,
HORACE A. DODGE.