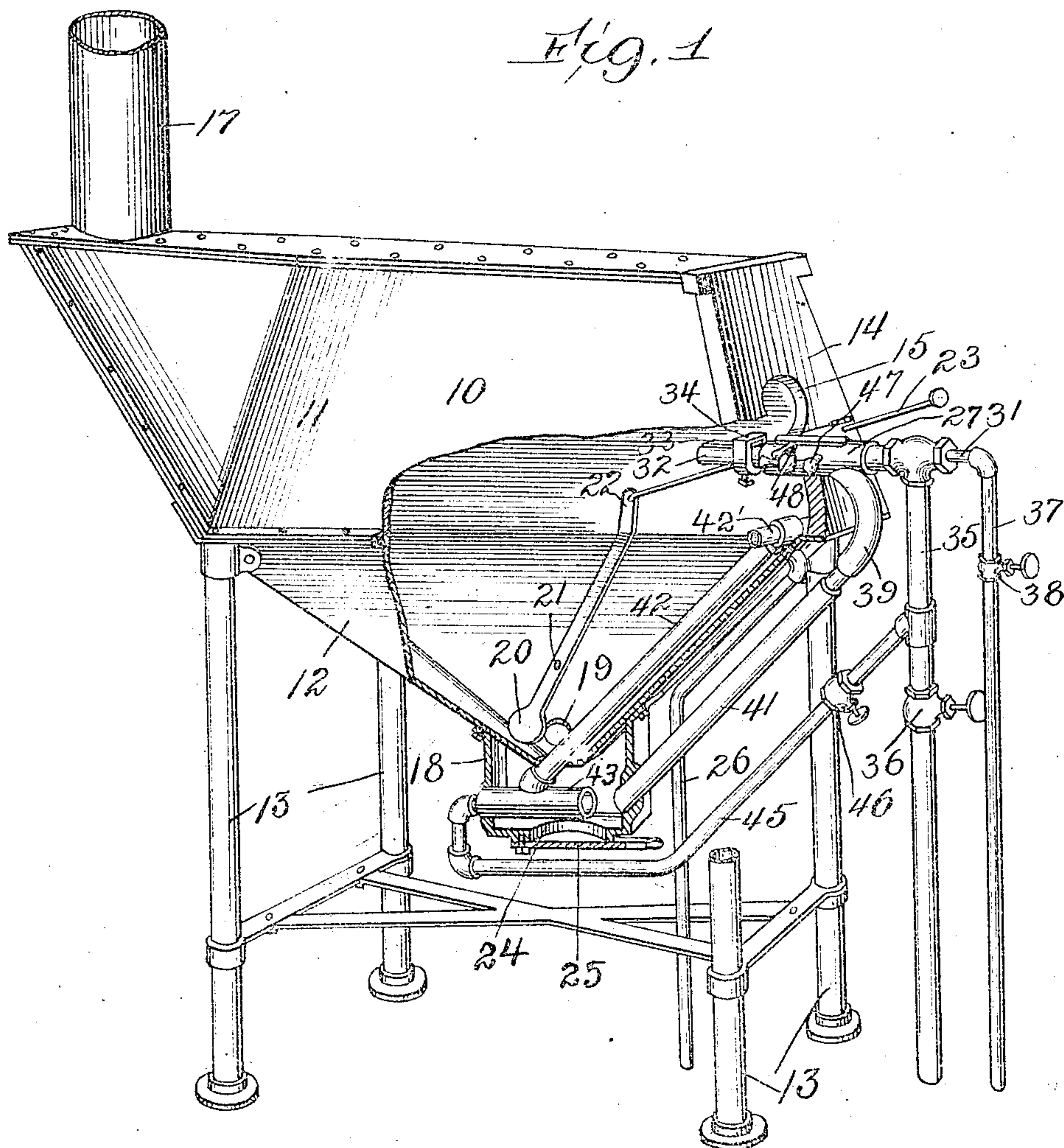


No. 819,922.

PATENTED MAY 8, 1906.

A. H. RADELL.
FILE SHARPENING APPARATUS.
APPLICATION FILED SEPT. 12, 1904.

2 SHEETS—SHEET 1.



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By Jorée Bain
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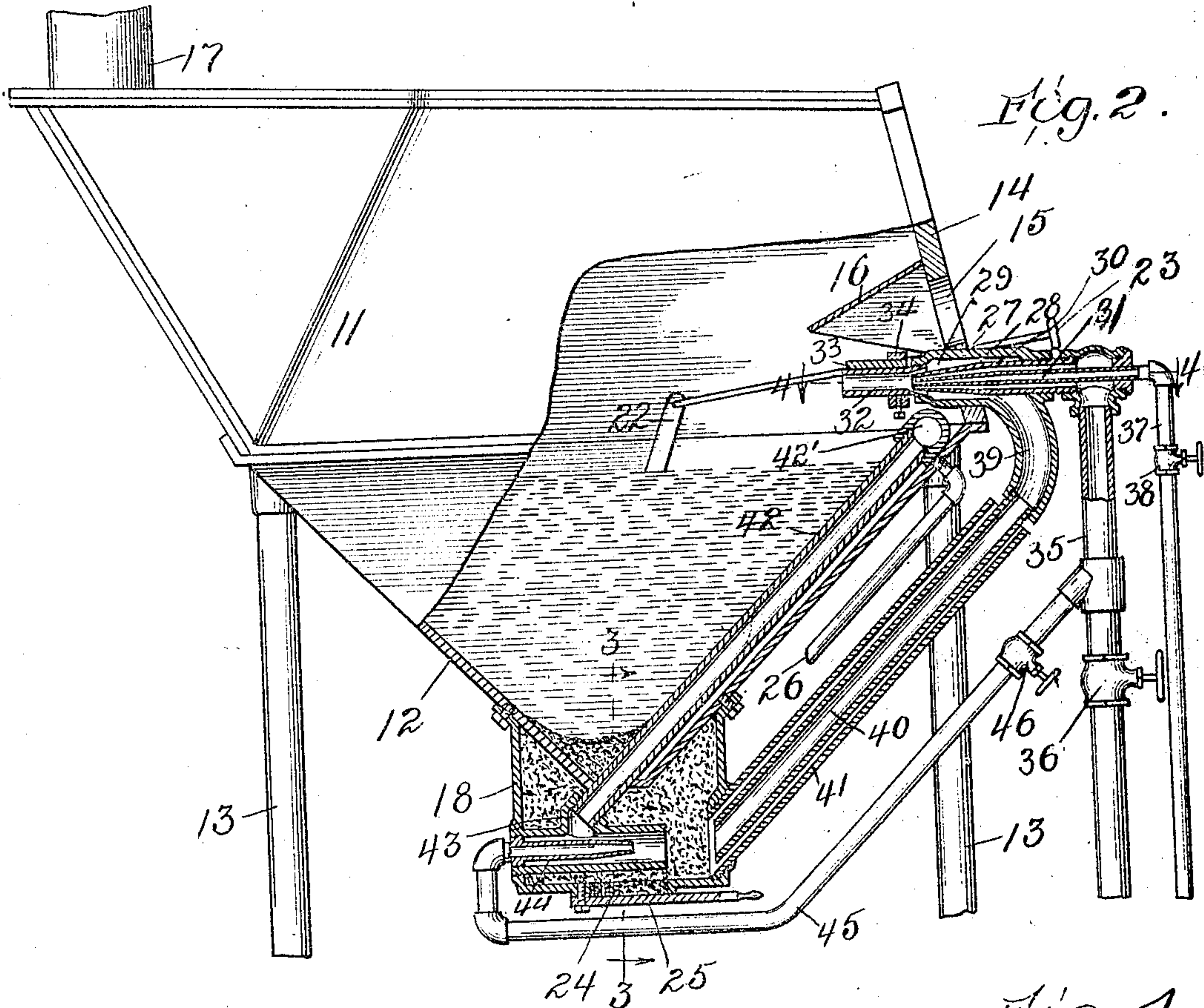


Fig. 3

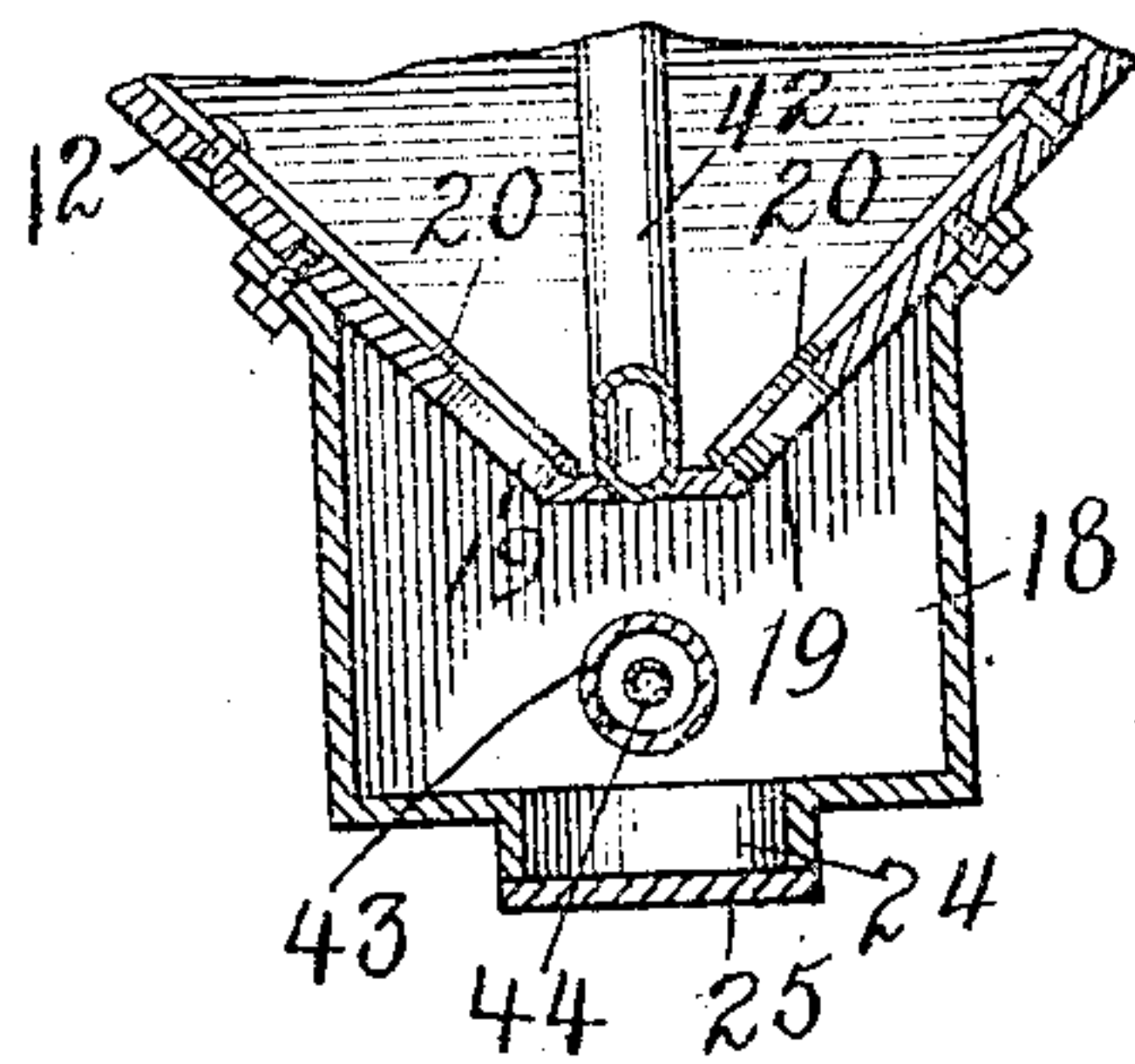
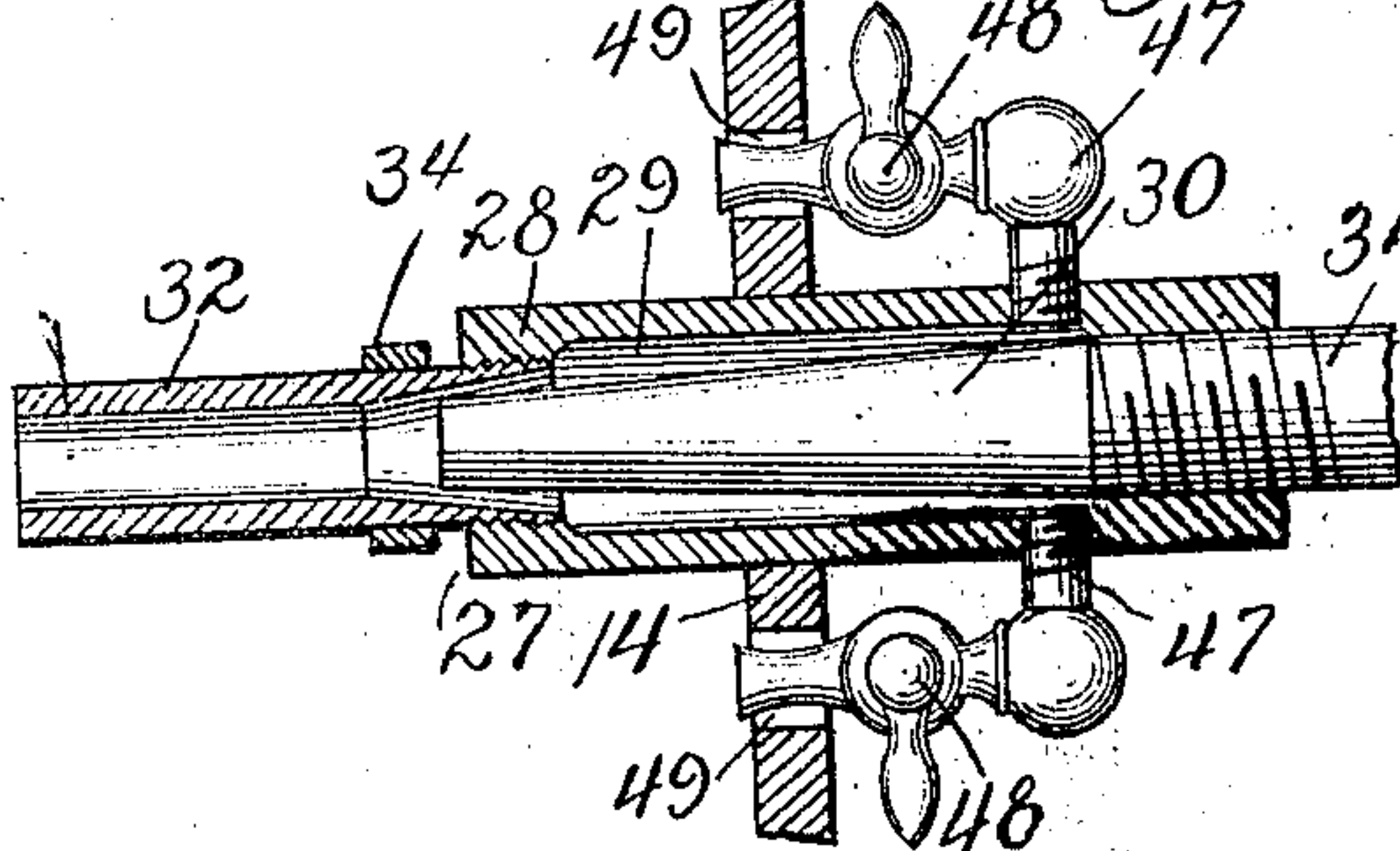


Fig. 4



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UNITED STATES PATENT OFFICE.

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FILE-SHARPENING APPARATUS.

No. 819,922.

Specification of Letters Patent.

Patented May 8, 1906.

Application filed September 12, 1904. Serial No. 224,206.

To all whom it may concern:

Be it known that I, ANTHONY H. RADELL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in File-Sharpening Apparatus; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention has particular reference to file-sharpening machines; but its teachings are broadly applicable to abrading-machines of the general type of the apparatus herein disclosed for whatever purpose they may be used.

Heretofore abrading-machines for sharpening files have been constructed providing a steam-injector or blast device suitably connected by piping with a source of supply of abrasive material—such as sand, emery, or carborundum, either dry or immersed in water—for the purpose of projecting the abrasive material against the tool or article to be sharpened or abraded. The machines of this simple construction have been found deficient for file-sharpening purposes, for the reason, among others, that they draw the abrasive material in a stream so dense that its weight makes the action sluggish and the velocity of projection is too low for efficient adhesive action, and, further, that when used with moist material they take up with the material an undue amount of moisture, which is augmented by the condensation of the injected steam as it mingles with relatively cool abrasive material. The projection of quantities of free water against the file is detrimental, in that the water serves as a cushion to prevent the abrasive material from acting properly upon the surface to be abraded. On the other hand, dry material has the disadvantage that it heats the tool being sharpened to such a degree as to affect its temper and is otherwise unsatisfactory. Furthermore, the material, wet or dry, being in a relatively cool state when supplied to the steam-injector (wherein is usually employed as the motive fluid steam under high pressure and with a high degree of superheat) the condensation and contraction of the steam resulting from its contact with the relatively cool material reduces its velocity to such an extent as to seriously impair the working efficiency of the

machine. Other objections to machines of the general construction described are overcome by the construction disclosed in my prior patent, No. 673,576, dated September 10, 1901, wherein an air-pipe is provided to supply air to the material-pipe with the abrasive material; but in the machine of my prior patent the air was taken directly from the atmosphere and reached the point of mixture with the steam of the injector in a relatively cool condition, so that the disadvantages following from undue steam condensation were not thereby overcome.

My present invention has for its salient object to provide a machine operable by a steam-injector wherein means are provided for minimizing the condensation of the injected steam.

A further object of my invention is to provide a means for regulating the quantity of abrasive material projected by the injector.

Another object of my invention is to provide means for preventing the clogging of the machine by the abrasive material when not in operation.

A still further object of my invention is to provide an auxiliary means for actuating the apparatus when the steam-supply is insufficient to properly inject the abrasive material, and a still further object of my invention is to provide a machine embodying improvements in its principles of operation and in the detail of its construction.

In the drawings I have represented an operative embodiment of my invention in four views, whereof—

Figure 1 is a perspective view of a completed apparatus with parts of the casing broken away to show the interior arrangement thereof. Fig. 2 is a central vertical cross-section taken longitudinally of the machine, with parts in elevation. Fig. 3 is a sectional detail on line 3 3 of Fig. 2 looking in the direction of the arrows. Fig. 4 is a sectional detail of the injector arrangement, taken on line 4 4 of Fig. 2.

Throughout the drawings like numerals of reference refer always to like parts.

Referring now to the drawings, 10 indicates a casing comprising, preferably, a top structure 11, opening at its lower end into a bottom structure 12, supported on suitable legs 13.

14 indicates a hinged door forming the up-

per portion of the front end of the top structure and provided with an aperture 15, through which a tool to be sharpened may be inserted into the interior of the casing.

5 16 indicates a guard overhanging the opening 15 in the inside of the chamber 13.

17 indicates a steam-outlet spout-opening through the top or deck of the casing member 11 at the extreme rear end thereof. The
10 bottom 12 is preferably hopper-shaped, but may be of any suitable shape to cause granular material placed therein to seek a relatively small area at the bottom thereof.

18 indicates a box or well secured to the
15 hopper-bottom 12 below the small end thereof and having a regulable communication with the interior of the casing member 12 by apertures 19, made through the walls of the bottom 12 and adapted to be regulated by
20 suitable adjustable valves.

In the specific construction, 20 20 indicate valves pivoted on the interior of the bottom 12, as at 21, and having lever-arms 22 extending upward therefrom and each connected
25 with an operating push-rod 23, extending to the exterior of the casing. Obviously by manipulating the push-rods 23 the valves 20 may be moved to open or close the apertures 19 to any desired extent. An outlet 24 is
30 preferably made in the bottom of the well 18 and is provided with a closable door 25 of any suitable construction.

In practice abrasive material consisting, preferably, of a mixture of carborundum and
35 ground quartz, sufficient in quantity to fill the well 18 and the lower extremity of the hopper 12, is placed in the machine and the hopper-bottom is filled with water to a suitable level determined by the position of an
40 overflow-pipe 26, in open communication with the interior of the casing. Preferably the level at which the water is maintained is slightly below the top of the hopper 12, the space in the casing above the water-level constituting what I will term a "hot-air chamber."
45

27 indicates generally an injector arranged to discharge into the air-chamber of the casing just below the aperture 15. The injector
50 comprises a shell 28, inclosing a vacuum-chamber 29, through which extends a steam-nozzle 30, and, preferably, an air-nozzle 31, concentrically arranged within the steam-nozzle 30.

32 indicates a removable tip screwed into the front end of the shell 28 and serving to direct the material impelled through the injector into the casing.

33 indicates a testing-block detachably secured to the tip 32, as by a clamp 34.

35 indicates a steam-pipe for supplying steam to the steam-nozzle 30 and provided with a suitable cut-off valve 36.

37 indicates an air-pipe for compressed air,

communicating with the air-nozzle 31 and 65 provided with a cut-off valve 38.

39 indicates an inlet to the vacuum-chamber of the injector, communicating, as by a suitable conduit 40, with the well 18, which constitutes a source of abrasive material. 70
Preferably the pipe 40 is threaded at its upper end into the inlet 39 and at its lower end is telescoped in a pipe 41, fixed in a suitable aperture in the side of the well 18.

It will be apparent now that if steam, or 75 steam and compressed air, be turned into the machine by the opening of valves 36 and 38 the jets will tend to produce a vacuum in the vacuum-chamber 29 of the injector and that the tendency to equalization of pressures in 80 the machine will start the circulation of whatever material may be supplied to the end of conduit 40 through said conduit, the injector, and back into the machine, as will be well understood by those skilled in the art. In my 85 machine I provide means for supplying highly-heated gaseous material, preferably air, steam, or steam and air, heated to or in excess of the boiling-point of water, to the material-conduit with the abrasive material. 90

Specifically 42 indicates a conduit extending up the interior front side of the hopper 12 and at its upper end communicating with a transverse head 42', preferably open at both ends. The lower extremity of the pipe 42 95 extends through the bottom of the hopper 12 and connects with the horizontal head 43, the forward end of which is preferably in alignment with the open end of the pipe 40 at a short distance therefrom. It is unnecessary 100 to leave the space between the head 43 and the pipe 40 open throughout its entire peripheral extent, and the head 43 might be extended forward into communication with the pipe 41 with only relatively small apertures intermediate pipe 40 and the point of connection of the air-pipe 42 with the head 43, if so desired. 105

Assuming that the proper quantities of abrasive material and water are in the machine, steam is turned onto the injector 110 through the valve 36 and at once the injector begins to work. It will be apparent that as the abrasive material is of relatively high specific gravity it will sink to the bottom of 115 casing 10 and be directed by the inclined sides of the hopper 12 to the openings 19, 19, through which it passes to the well 18. The injector, therefore, draws moist abrasive material from the well 18 mingled with the air 120 supplied by conduit 42 from the air-chamber in the interior of the machine above the water-level. The machine should be run for several minutes prior to commencing active work. During this time the interior of the 125 casing heats up to a high degree by reason of the constant introduction of superheated steam therein, so that after the machine has

been in operation for a short time the gaseous matter drawn through the conduit 42 consists of a mixture of steam and air heated to a high degree, equal to or in excess of the boiling-point of water. This highly-heated gaseous matter mingling with the moist abrasive material heats the latter, so that the entire body of material introduced into the vacuum-chamber of the injector is heated to such a degree that the injected steam issuing from the nozzle 30 is not condensed upon coming in contact with the abrasive material body to the extent that it would be were said body introduced at its normal relatively cool temperature with or without relatively cool air. Should the steam-pressure be too low for advantageous use, the compressed-air jet is turned on to augment the injector action. It is to be noted that the air employed passes through the steam-pipe and is heated by the steam to a degree sufficiently high to keep it from unduly condensing the steam as it leaves the nozzle.

When the machine becomes heated up to its normal working temperature, a file or other tool to be sharpened or abraded may be inserted through the aperture 15 into the path of discharge of the material flowing through the injector, so that it is acted upon by the abrasive mixture forcibly impelled at a high velocity by said injector and rapidly sharpened.

Machines constructed as I have described I have found highly efficient, for the reason that while the abrasive material is moist enough to prevent the deleterious heating of the instrument being sharpened the velocity of the blast is not impeded by undue condensation of the injected steam nor the abrading action retarded by the presence of an undue amount of free moisture by reason of such steam condensation. The steam accumulating in the air-chamber condenses to a great extent against the outer walls thereof and the water of condensation runs down into the hopper 12, so that a constant overflow through the pipe 26 is kept up, which serves to carry off the grease and other light refuse that accumulates within the casing. The surplus steam is permitted to escape through the outlet 17.

It will be apparent that by regulating the openings of the valves 19 I can regulate the amount of abrasive material admitted to the well 18, constituting the source of supply for the injector. It will further be apparent that when I desire to stop the machine I can by moving the valve 20 to closed position cut out entirely the direct connection between the well 18 and the interior of the hopper 12, so that by exhausting substantially all of the abrasive material from the well 18 through the injector or dumping it through the outlet 24 the well may be emptied and no clogging of the pipes can be effected during

the time that the machine is out of operation.

In addition to the parts thus far described I prefer to employ an auxiliary jet of gaseous material under pressure and preferably in a highly-heated state to assist in feeding the gaseous and abrasive material to and through the material pipe or conduit 40. To this end in the specific construction illustrated I provide a steam-nozzle 44, extending into the head 43 from the rear thereof and preferably projecting past the point of juncture of the pipe 42 with said head. The nozzle 44 is connected by a pipe 45, valved as at 46, with the steam-pipe 35, preferably above the valve 36. Compressed air, suitably heated, might, however, obviously be employed in place of steam. The auxiliary jet operates as a regulable means for impelling the heated gaseous matter and abrasive material into and through the conduit 40, thereby relieving the drag upon the injector 27.

While I have described the air-pipe 42 as taking air from the interior of the machine, and prefer to so arrange it, it will be apparent that when the auxiliary jet 44 is employed the air may be taken direct from the exterior of the machine, the steam of said auxiliary jet serving to heat it to a proper degree, and that some of the advantages of my machine would be attained were the air-pipe wholly omitted and the auxiliary jet alone employed to supply gaseous material to the material-pipe. The extension of the pipe 42 to the interior of the chamber above the water-line serves to utilize heat that would otherwise be wasted in the machine, and said chamber forms a convenient source of supply of the heated air or gaseous matter; but it will be apparent that the teachings of my invention will be followed by heating the air or other gaseous material at any desired point in its path of travel from the general atmosphere to the point of its intermixture with the abrasive material for supply to the material-pipe, provided the degree of heat imparted to the air be sufficient for the purposes herein described. I also prefer to provide in my machine means for regulating the quantity of material supplied to the injector through the material-conduit, and to this end I provide regulable means for relieving the vacuum in the vacuum-chamber of the injector.

In the drawings, 47 47 indicate relief-pipes provided with petcocks 48 48, said relief-pipes being arranged to establish communication between the hot-air chamber of the machine and the vacuum-chamber 29 of the injector 28. To this end the nozzle of the said cocks are extended through apertures 49, made in the front end of the superstructure 11, below the door 14 thereof. It will be apparent now that by varying the adjustment of said cocks 48 the difference in pressure between the interior of the casing and the vacu-

um-chamber 29 may be reduced or increased, so that the action of the injector upon the material in the material-conduit 40 will be proportionately diminished or increased and the volume of abrasive material discharged accordingly varied. It is to be noted that the air taken into the relief-pipe 47 comes from the air-chamber of the machine, and therefore the air does not serve to unduly condense the injected steam.

While I have herein described in some detail a specific construction of my device, the details of which I claim as new and advantageous, I do not desire to be understood as restricting the broad features of my invention to such construction, as it will be apparent that features of my invention are susceptible of embodiment in machines differing widely from that herein illustratively disclosed.

Having described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a machine of the character described, a steam-injector having a vacuum-chamber, a chamber containing moist abrasive material, a material-conduit connecting the material-chamber and the injector vacuum-chamber, and means for supplying gaseous material in a highly-heated condition to the vacuum-chamber with the moist abrasive material.

2. In a machine of the character described, a steam-injector having a vacuum-chamber, a casing into which the injector discharges, having a portion for containing abrasive material immersed in water, a material-conduit connecting said casing portion with the injector vacuum-chamber, and means for supplying highly-heated gaseous matter to the material-conduit with the wet abrasive material.

3. In a machine of the character described, the combination with a steam-injector, of means for supplying highly-heated air and abrasive material to the injector.

4. In a machine of the character described, the combination with a steam-injector, of a material-conduit communicating with the vacuum-chamber thereof, and means for supplying air in a highly-heated condition to the material-conduit.

5. In a machine of the character described, the combination with a steam-injector, of a material-conduit communicating with the vacuum-chamber thereof, a source of supply of abrasive material for the material-conduit, and means for supplying air heated to or in excess of the boiling-point of water to the material-conduit with the abrasive material.

6. In a machine of the character described, the combination of a steam-injector, a source of supply of abrasive material therefor operatively associated with the injector to supply abrasive material to the vacuum-chamber thereof, a source of supply of highly-heated gaseous matter, and connections between

said source of supply of gaseous matter and the source of supply of abrasive material, arranged to mix gaseous matter with the abrasive material being supplied to the injector.

7. In a machine of the character described, the combination of a steam-injector, a material-supply conduit operatively associated therewith, and a conduit arranged for supplying gaseous material to the material-supply conduit, the path of the gaseous matter including a highly-heated area.

8. In a machine of the character described, the combination of a steam-injector, a source of supply of abrasive material, a conduit extending from the injector to the source of abrasive-material supply, a source of heated-air supply, and an air-conduit arranged to conduct heated air from the source of heated-air supply to the source of material-supply.

9. In a machine of the character described, the combination of a casing, a steam-injector arranged to discharge into a chamber of the casing, a source of material-supply for the injector, and a conduit connecting the chamber into which the injector discharges with the source of material-supply.

10. In a machine of the character described, the combination of a casing, a steam-injector arranged to discharge into an air-chamber of the casing, a material-conduit associated with the vacuum-chamber of the injector, a source of supply of abrasive material for said material-conduit, and an air-conduit leading from the said air-chamber into operative association with the material-conduit.

11. In a machine of the character described, an injector, a material-conduit communicating with the vacuum-chamber of the injector, a source of supply of abrasive material with which said material-conduit communicates, and an auxiliary jet for gaseous matter arranged to discharge into the abrasive material to impel it through the material-conduit.

12. In a device of the character described, the combination with an injector, of a material-conduit communicating with the vacuum-chamber thereof, a source of supply of abrasive material with which the material-conduit communicates, and an auxiliary steam-jet arranged to impel abrasive material through the material-conduit.

13. In a device of the character described, the combination with an injector of a source of material-supply, a connection between the vacuum-chamber of the injector and the source of material-supply, an air-conduit arranged to supply air to the material-conduit for mixture with the abrasive material, and an auxiliary jet of gaseous material under pressure, arranged to induce a flow of air through said air-conduit toward the material-conduit.

14. In a machine of the character de-

scribed, a steam-injector, a material-pipe, a source of material-supply with which said material-pipe communicates, and a means of supply of gaseous matter under pressure extending into the source of material-supply and arranged with its outlet in alinement with the opening of the material-pipe, to discharge into the material-supply pipe.

15. In a machine of the character described, a steam-injector, a source of material-supply, a material-conduit connecting the source of supply and the injector, and a steam-jet arranged within the source of material-supply and arranged to inject steam into the material-conduit with the abrasive material supplied thereto.

16. In a machine of the character described, an injector, a source of material-supply, and a conduit connecting the said source of supply and the injector, said conduit comprising telescoping pipes, one only being connected to the injector and the other extending to the source of material-supply.

17. In a machine of the character described, the combination with an injector, of a structure through which material to be supplied to the injector is drawn, comprising a pipe connected with said structure, and a second pipe telescopically associated with the first, connected with the vacuum-chamber of the injector.

18. In a device of the character described, the combination of a casing having a chamber into which an injector discharges, a well at the bottom of the casing, an injector discharging into the casing, a material-pipe leading from the injector into the well, and a conduit leading from the chamber into which the injector discharges into the well.

19. In a device of the character described, the combination of a casing having a chamber into which the injector discharges, and a material-hopper, a well below the hopper, an injector discharging into the casing, a material-pipe arranged without the casing and composed of telescoping sections, one connected with the injector and the other leading

into the well, and a conduit leading from the chamber into which the injector discharges to a proper point in the well to supply air to the material-pipe.

20. In a machine of the character described, an injector, a source of material-supply operatively connected with the vacuum-chamber of the injector, and regulable means for supplying gaseous matter to the path of the material immediate the source of supply and the point of egress from the injector.

21. In a device of the character described, an injector, a source of material-supply operatively connected with the vacuum-chamber of the injector, and means for admitting gaseous material to said vacuum-chamber.

22. In a device of the character described, the combination with a casing into an air-chamber whereof an injector discharges, the injector, a source of material-supply operatively connected with the vacuum-chamber of the injector, and regulable connections between the chamber into which the injector discharges and the vacuum-chamber of the injector.

23. In a machine of the character described, an injector comprising a vacuum-chamber, a steam-nozzle, and a compressed-air nozzle, and a source of supply of abrasive material operatively connected with the vacuum-chamber of the injector.

24. In a machine of the character described, the combination of an injector comprising a vacuum-chamber, a steam-nozzle extending through the vacuum-chamber, and a nozzle for compressed air extending through the vacuum-chamber within the steam-nozzle, and a source of material-supply operatively connected with the vacuum-chamber of the injector.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

ANTHONY H. RADELL.

In presence of—

GEO. T. MAY, Jr.,
MARY F. ALLEN.