Dec. 30. 1924.

1,521,382

J. McPHERSON

CONDENSER TUBE PLUG EXTRACTOR

Filed March 25, 1924

2 Sheets-Sheet 1

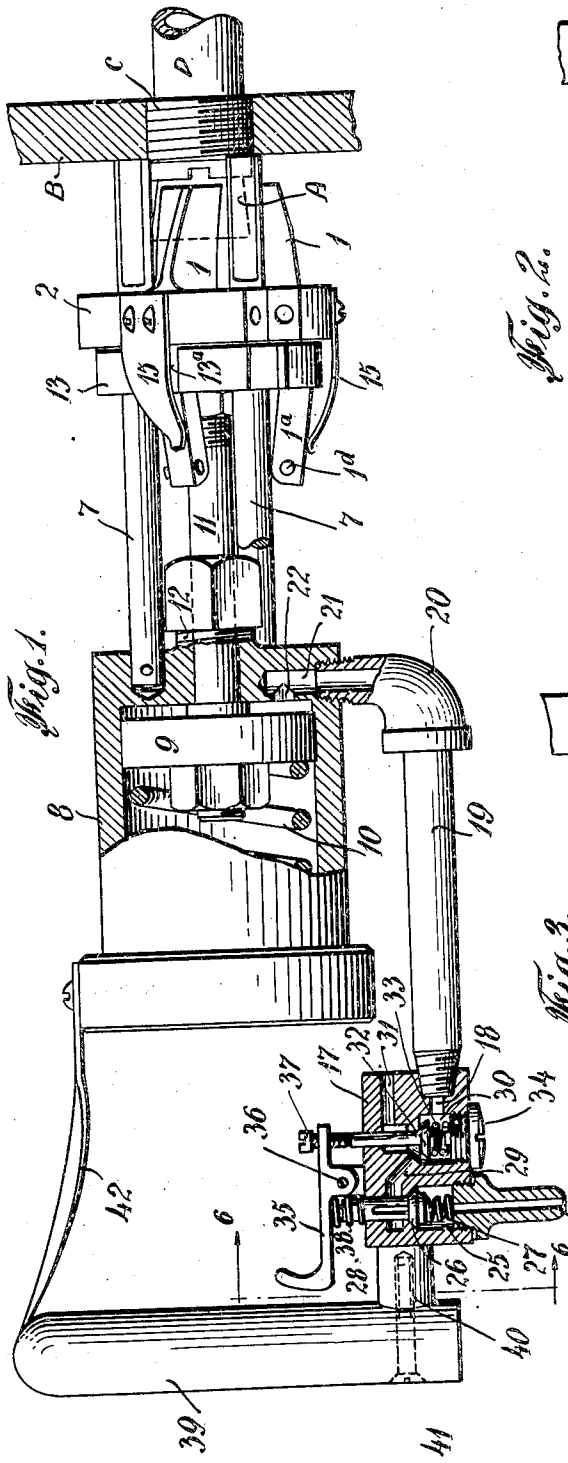


Fig. 1.

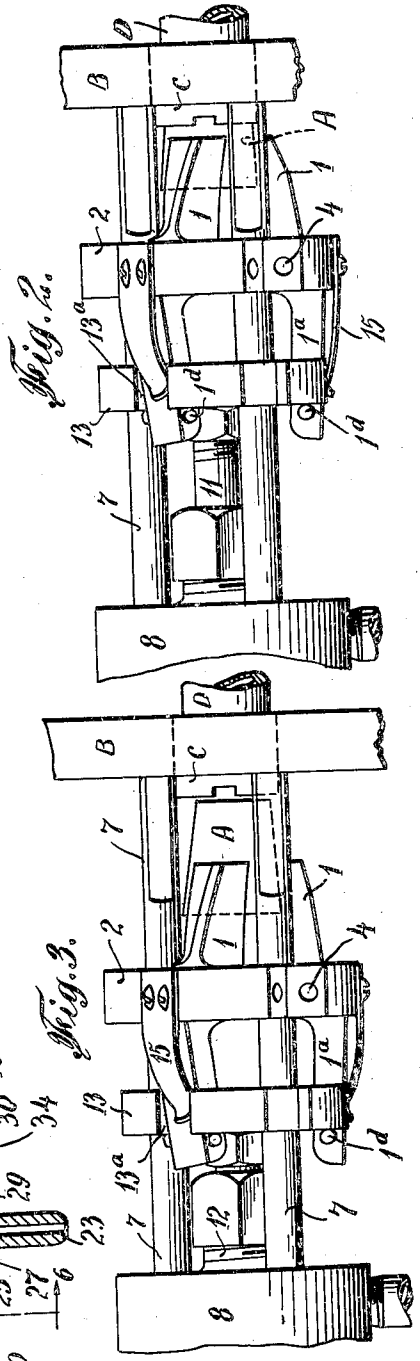


Fig. 2.

Fig. 3.

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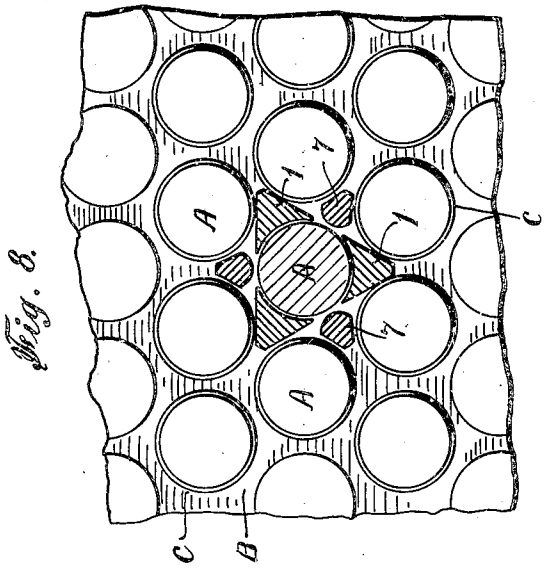


Fig. 8.

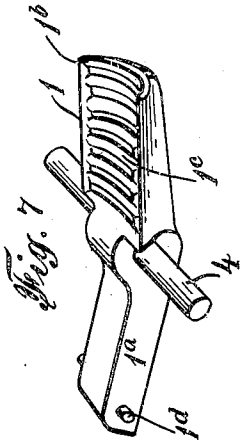


Fig. 7.

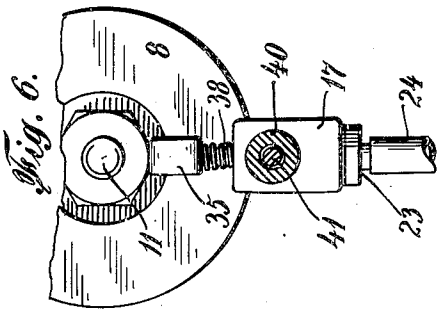


Fig. 6.

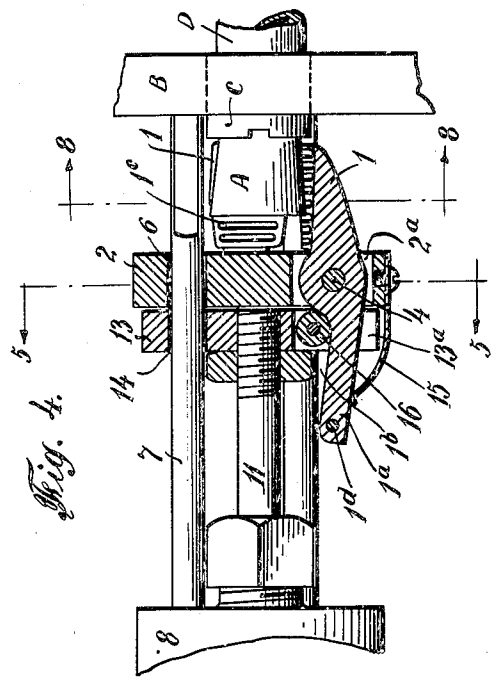


Fig. 4.

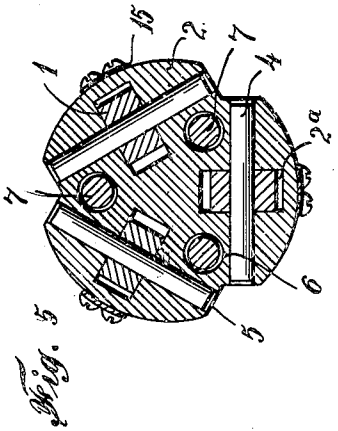


Fig. 5.

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UNITED STATES PATENT OFFICE.

JAMES McPHERSON, OF NEW YORK, N. Y.

CONDENSER-TUBE-PLUG EXTRACTOR.

Application filed March 25, 1924. Serial No. 701,655.

To all whom it may concern:

Be it known that I, JAMES McPHERSON, a citizen of the United States, and resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Condenser-Tube-Plug Extractors, of which the following is a specification.

In surface condensers, comprising tube sheets and tubes therebetween, the tubes are liable to leak and admit cooling water to the condensate, and it has been the practise, so far as I am aware, to drive plugs into the ends of the leaking tubes until such time as the leaking tubes are removed and replaced. It has been slow and costly to remove the plugs from the tubes when the latter are to be replaced, particularly since the plugs are usually made of wood which swells tightly in the condenser tubes, and as the plugs are wet they are liable to be broken in the effort to remove them from the tubes, which has increased the time and cost required to remove the plugs.

The object of my invention is to provide an extractor having jaws adapted to receive and grasp the aforesaid condenser tube plugs and withdraw them from the tubes expeditiously, the jaws being so arranged as to enter the spaces between plugs surrounding the plug to be extracted so as not to disturb any adjacent plugs.

My invention comprises novel details of improvement that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part hereof, wherein—

Fig. 1 is a partly sectional side elevation of a plug extractor embodying my invention;

Figs. 2 and 3 are detail views illustrating the plug extracting parts in different positions;

Fig. 4 is a sectional detail showing the jaws in position to grasp a plug;

Fig. 5 is a cross section on line 5, 5, in Fig. 4;

Fig. 6 is a detail section on line 6, 6, in Fig. 1;

Fig. 7 is a perspective detail of one of the movable jaws, and

Fig. 8 is a section on line 8, 8, in Fig. 4, showing the jaws in position to grasp a tube plug.

Similar numerals of reference indicate corresponding parts in the several views.

The numeral 1 indicates a plurality of jaws which are spaced apart annularly in position to receive and grip plung A therebetween. The jaws 1 are pivotally carried by a reciprocative head or disk 2. The head or disk 2 is shown provided with apertures 2^a within which the jaws 1 are pivoted between their ends by means of pivots or pins 4 which are shown located in holes 5 in head 2, (Fig. 5). The head 2 is guided to reciprocate and for such purpose is shown provided with annularly spaced holes 6 that receive correspondingly spaced rods 7, which rods are shown projecting from and are secured to a cylinder 8. Within said cylinder a piston 9 is reciprocative, being normally pressed inwardly or toward the head 2 by means of a suitable spring 10, said piston being provided with a piston rod 11 extending from the cylinder through a stuffing box 12. The piston rod 11 is secured to a member or disk 13 that is reciprocative along the rods 7 by means of holes 14 in said member through which the rods pass, (Fig. 4). The member 13 cooperates with the projecting portions or arms 1^a of jaws 1 to cause the opposite or outer ends of said jaws to approach to grasp a plug A and springs 15 secured to and projecting from head 2 cooperate with arms 1^a to normally force them toward member 13, whereby to spread the outer ends of the jaws 1 apart. The projecting portions or arms 1^a of jaws 1 are shown operative in slots 13^a of member or disk 13, and in order to reduce friction and wear along the arms 1^a I provide anti-friction rollers 16 pivotally supported upon and forming parts of member 13 within the slots 13^a to bear against the normally inclined inner surfaces 1^b of arms 1^a, (Fig. 4).

In order to supply fluid under pressure into cylinder 8 to operate piston 9 to cause the jaws 1 to grasp plug A any suitable means may be provided. I have illustrated a valve casing 17 having a port 18 communicating through tube 19 and elbow 20 with a passage 21 in the head of cylinder 8, from which a port 22 leads to the interior of the cylinder at the inner side of piston 9, (Fig. 1). A nipple 23 attached to valve casing 17 is adapted to be connected by a hose 24 to a source of fluid pressure, such as with an air compressor or a steam supply pipe, which nipple communicates with a chamber 25 in

valve casing 17, (Fig. 1). A valve 26 is normally pressed to its seat by spring 27. The fluted stem of the valve operates in the bore 28 that communicates with a passage 29 in casing 17, which passage leads to a chamber 30 in said casing that communicates with port 18 and with an exhaust port 31 leading to atmosphere. A valve 32 in chamber 30 is adapted to close communication from said chamber to passage 31. A spring 33 operating against said valve and against a plug 34 tends to close said valve against its seat. A trigger or lever 35 is pivotally supported at 36 on casing 17 and is shown provided with an adjustable stop in the form of a screw 37 cooperative with the stem of valve 32, a spring 38 between casing 17 and trigger 35 normally actuating said trigger to cause unseating of valve 32 against the pressure of spring 33. The trigger 35 opposes the stem of valve 26 and is shown spaced therefrom. In the normal position of the parts shown in Fig. 1 the passages are open from cylinder 8 through tubing 19, port 18, chamber 30 and passage 31 to atmosphere for exhaust of pressure from the cylinder. When trigger 35 is first operated it permits valve 32 to seat to close the exhaust passage 31, and further operation of said trigger causes valve 26 to open the passage from nipple 23 for fluid pressure to passage 29 and thence from chamber 31 through port 18 and tubing 19, 20, through passage 21 and port 22 into the cylinder to cause piston 9 to move outwardly against the resistance of spring 10.

A handle 39 is shown secured to casing 17 by means of extension 40 on the casing and screw 41 and by means of a strap or brace 42 connected with handle 39 and with cylinder 8, whereby the machine can be conveniently manipulated.

Fig. 8 illustrates, diagramatically, a tube sheet B of a surface condenser in which a series of ferrules C are located in a usual way to receive the condenser tubes D in which the plugs A are driven when the condenser tubes leak. In the normal position of the parts the spring 10 forces piston 9 toward the inner end of cylinder 8 and also forces member 13 against head 2 to push the latter outwardly so that the jaws will normally spread to receive plug A, the parts being in the positions shown in Figs. 1 and 4. By preference, the rods 7 project beyond the outer ends of jaws 1 so that said rods may abut against the tube sheet B and the jaws will be at a suitable distance therefrom so as not to encounter the ferrules C. With the parts in the last named position the machine is applied so that the jaws 1 will receive between them the plug A to be removed. It will be noted in Fig. 8 that three rods 7 are spaced at substantially 120° apart and that the jaws 1 are correspondingly spaced and located in the spaces between said rods, the outer surfaces of jaws 1 being inclined or converging outwardly from the inner curved surfaces 1^b, which are curved to substantially correspond to the exterior contours of plugs A, such inner surfaces of the jaws being preferably serrated or threaded at 1^c, as indicated in Figs. 4 and 7, to grip the plugs. The outer surfaces of rods 7, adjacent to the jaws, are shown inclined or converged outwardly from the inner surfaces. As shown in Fig. 8, the rods 7 and the jaws 1 are adapted to fit in the spaces between several plugs A that surround the plug that is intended to be extracted from a tube. When the jaws have been placed to receive a plug A therebetween the rods 7 are held pressed against tube sheet B or the adjacent ferrules and then the trigger 35 will be operated to cause valve 32 to close, and valve 26 to open to admit fluid pressure into cylinder 8, whereupon piston 9 will be forced outwardly against the resistance of spring 10. When piston 9 moves outwardly it will draw member 13 toward the cylinder, from the position shown in Fig. 1, and the travel of said member will cause the projecting portion or arms 1^a of jaws 1 to be spread apart, whereby the outer portions of said jaws will be caused to forcibly grip plug A therebetween, the parts now assuming the position shown in Fig. 2. The outer end portions of the arm 1^a are provided with stops 1^d, shown in the form of pins projecting on opposite sides of the corresponding arms, in position to be engaged by the member 13 when the member has moved to the position shown in Fig. 2. When member 13 engages the stops 1^d further lateral movement of the arms 1^a will be stopped, limiting the squeezing of the jaws against plug A, and continued movement of member 13 toward cylinder 8 will cause said member, by engagement with stops 1^d, to draw the jaws 1 and head 2 toward the cylinder, and since the jaws then forcibly grip plug A the latter will be extracted from the tube, the parts assuming the position substantially as shown in Fig. 3. The machine may now be removed from the tube sheet and when trigger 35 is released valve 26 will be seated to stop the flow of pressure fluid, and spring 38 by operating the trigger will cause valve 32 to be unseated so that passage 31 will be open to atmosphere for exhaust of the fluid from cylinder 8, whereupon spring 10 will push piston 9 within the cylinder, member 13 will be correspondingly pushed outwardly and during its travel toward head 2 the springs 15 will cause the arms 1^a of jaws 1 to approach, whereby said jaws will release plug A. Further continued outward travel of member 13 will push head 2 with jaws 1 outwardly. and the parts will resume the position shown in Fig. 1 with the jaws 1

spread ready to receive and extract another plug, and so on.

By means of my invention I provide a simple and efficient machine adapted to expeditiously extract plugs from tubes without causing the plugs to be broken while being extracted, and effecting a saving in time and expense in extracting such plugs.

While I have illustrated a cylinder and piston for operating the disk 13 and head 2, it will be understood that any other suitable means may be provided for such purpose, and my invention is not limited to the details of construction set forth as the same may be varied, within the scope of the appended claims, without departing from the spirit of my invention.

Having now described my invention what I claim is:

1. An extractor comprising a plurality of jaws, means to movably support the jaws, a member cooperative with the jaws to actuate them to grip an article, means cooperative between the jaws and said member to limit the grip of the jaws on the article and cause the jaws to extract the article, and means to actuate said member.

2. An extractor as set forth in claim 1, in which the member is in position to actuate the first named means to locate it in position to receive the article between the jaws.

3. An extractor comprising a plurality of jaws, a movable head movably supporting the jaws, a member movable toward and from the head and cooperative with said jaws to cause them to grip an article, the jaws having means cooperative with said member for moving the jaws and head with said member, and means to actuate the member.

4. An extractor as set forth in claim 3, in which the member opposes the head to push the latter to position to receive an article between the jaws.

5. An extractor comprising a plurality of jaws adapted to grip an article, a head movably supporting the jaws, means slidably guiding the head, a member movable relatively to the head, said jaws having portions cooperative with said member to actuate the jaws in one direction, springs to actuate the jaws in the opposite direction, and means to reciprocate said member.

6. An extractor as set forth in claim 5, in which the member is in position to push the head and jaws to position to receive the article between the jaws.

7. An extractor comprising a plurality of jaws, a head pivotally supporting the jaws, means slidably guiding the head, a member reciprocative relatively to the head, said member having slots receiving portions of the jaws, said portions of the jaws having inclined surfaces cooperative with the member for actuating the jaws, and means to reciprocate said member.

8. An extractor comprising a plurality of jaws, a slidable head pivotally carrying said jaws, and a member reciprocative relatively to the head, said jaws and member having cooperative means for operating the jaws and the head, said jaws having stops cooperative with the member to draw the head and jaws with said member.

9. An extractor as set forth in claim 8, in which the member is in position to push the head to position to receive an article between the jaws.

10. An extractor comprising a plurality of jaws, a head pivotally carrying the jaws, rods slidably supporting the head, a member slidable along said rods, said head and jaws having cooperative means to actuate the jaws to grip an article, and means cooperative between the jaws and member for drawing the jaws and the head by the member after the jaws have gripped an article therebetween.

11. An extractor comprising a plurality of jaws, a head pivotally supporting the jaws, spaced rods slidably guiding the head, a member operative along the rods, said member having slots receiving portions of the jaws, said member and jaws having cooperating means for actuating the jaws to grip an article therebetween, springs carried by the head cooperative with the jaws to spread them from the article, stops upon the jaws cooperative with the member for drawing the jaws and head after the member has operated the jaws to grip an article, and means to move the member toward and from the head.

12. An extractor comprising three annularly disposed jaws equi-distantly spaced apart, three rods located between the corresponding jaws, a head pivotally carrying said jaws and slidable on said rods, a member operative toward and from the head along said rods, said jaws and member having cooperative means for operating the jaws, means cooperative between the jaws and member to draw the jaws and head when the member has caused the jaws to grip an article therebetween, and means to reciprocate said member.

13. An extractor comprising a plurality of jaws, means to movably support the jaws, a member cooperative with the jaws to actuate them to grip an article, means cooperative between the jaws and said member to cause the jaws to extract an article, a piston having a rod connected with said member, a cylinder containing the piston, passages to supply fluid under pressure to the cylinder on one side of the piston, and valve means to control the flow of fluid to the cylinder through said passages and to permit exhaust of said fluid from the cylinder.

JAMES McPHERSON.