(No Model.)

2 Sheets—Sheet 1.

# A. F. CRAIG, A. NEILSON & J. SNODGRASS.

## CENTRIFUGAL APPARATUS FOR SEPARATING OILS.

No. 383,707. Patented May 29, 1888.

FIG. 2.

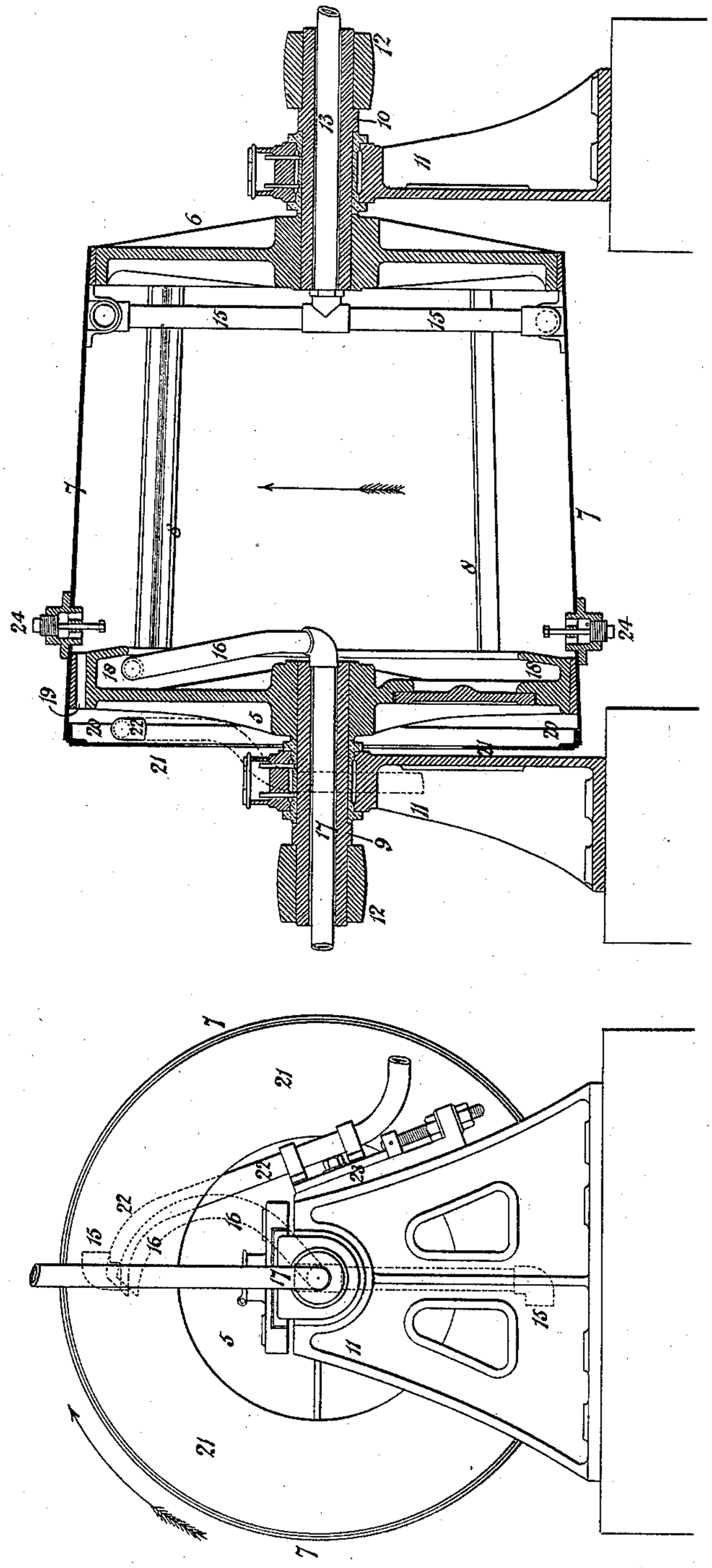


FIG. 1.




Witnesses:
Harry Drury.
Hamilton D. Turner.

Inventor:
A. F. Craig,
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by their Attorneys,
Howson and Sons

(No Model.) 2 Sheets—Sheet 2.

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FIG. 4.

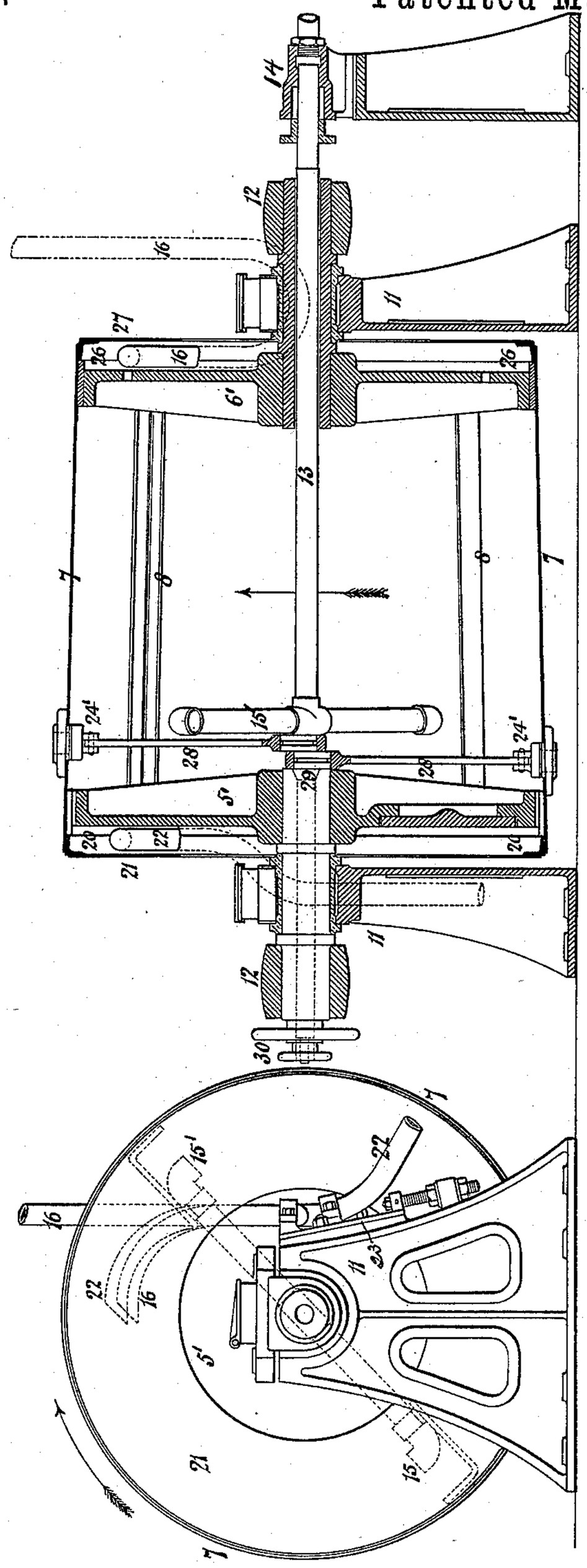


FIG. 3.

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# UNITED STATES PATENT OFFICE.

ARCHIBALD F. CRAIG, OF PAISLEY, ALEXANDER NEILSON, OF INKERMANN, COUNTY OF RENFREW, AND JAMES SNODGRASS, OF PUMPHERSTON, COUNTY OF MID-LOTHIAN, SCOTLAND.

## CENTRIFUGAL APPARATUS FOR SEPARATING OILS.

SPECIFICATION forming part of Letters Patent No. 383,707, dated May 29, 1888.

Application filed July 21, 1887. Serial No. 244,893. (No model.) Patented in England March 10, 1887, No. 3,617.

*To all whom it may concern:*

Be it known that we, ARCHIBALD FULTON CRAIG, a resident of Paisley, in the county of Renfrew, Scotland, ALEXANDER NEILSON, a resident of Inkermann, in the same county, and JAMES SNODGRASS, a resident of Pumpherston, in the county of Mid-Lothian, Scotland, all subjects of the Queen of Great Britain and Ireland, have invented certain Improvements in Apparatus for Separating Mineral or other Oils from Oils or Substances of Different Specific Gravities, (for which we have applied for a British patent to be dated March 10, 1887, No. 3,617,) of which the following is a specification.

Our said invention has for its object the continuous and expeditious separation of mineral or other oils from oils or substances of different specific gravities, one important application of our invention being in the refining of mineral oils for the separation of the lighter oils from the heavier oils, or tarry or other matters used or produced in the refining operation.

Our improved apparatus is of the centrifugal class, and comprises a rotating vessel placed with its axis horizontal, and formed with cast-iron end disks connected by a cylindrical or slightly-tapered shell of wrought-iron strengthened by internal angle-iron ribs, which also assist in imparting rotation to the liquid operated on. The mixture to be operated upon is led into the vessel through an axial pipe, and is supplied thence by radial pipes toward the shell, near one end, and in one modification the heavier oil or substance is delivered from the end near the radial inlet-pipes, the lighter oil being delivered from the other end, while in a second modification both the heavier and lighter portions are separately delivered from the end farthest from the inlet radial pipes. In both modifications the pipe through which the lighter oil is delivered is placed with its entrance-mouth facing the rotating current, and the momentum of the oil is taken advantage of to cause the oil to flow along the delivery-pipe even in an upward direction, when required, or when it may be convenient for leading the oil into storage-tanks or into apparatus in which it has next to be operated on.

Figure 1 on Sheet 1 of the accompanying explanatory drawings is an end elevation, and Fig. 2 is a longitudinal vertical section, of one modification of our improved apparatus. Fig. 3 on Sheet 2 is an end elevation, and Fig. 4 is a longitudinal vertical section, of a second modification.

In the drawings the same reference-numerals are used to mark the same or like parts wherever they are repeated.

In the modification shown in Figs. 1 and 2 the vessel, which is placed with its axis horizontal, consists of cast-iron end disks, 5 6, connected by a lightly-tapered circumferential shell, 7, of wrought-iron, strengthened by internal angle-iron ribs, 8. The disks 5 6 are formed with or fixed on tubular bosses or short shafts 9 10, projecting outward from their centers, and made with journals to run in pedestal-bearings 11, in which the apparatus is carried, the vessel being driven by means of pulleys 12, fixed on the shafts 9 10 and acted on by belts; or the vessel may be driven in other convenient way. The liquid to be operated on is introduced through an inlet-pipe, 13, passing through one, 10, of the tubular shafts, its outer end extending into a stationary stuffing-box, as shown at 14 in Fig. 4, on the end of the supply-pipe. On the inner side of the disk 6, at the smaller end of the vessel, the inlet-pipe 13 has connected to it two, or it might be more, radial pipes, 15, extending nearly to the circumference, and having their outer ends curved in the direction of rotation, so as to deliver the liquid quietly. The rotation of the vessel causes the heavier constituent of the liquid operated on to be nearest the circumferential shell 7, the lighter oil or constituent being nearer the center. The lighter oil is led off through a stationary pipe, 16, the open entrance end of which is placed, by preference, at or near the highest part of the annular layer of lighter liquid and near the disk 5, or end opposite to that at which the liquid to be operated on is introduced. The open end of the

pipe 16 faces the rotating current of oil, and from that point the pipe follows a curve to the center, where it is fixed to an axial pipe, 17, passing through the tubular boss or shaft 9 of the disk 5 and beyond the outer end of the shaft 9, proceeding in an upward or other direction, as may be convenient, the momentum of the oil enabling it to rise some distance, if required. This "oil-pipe," as it may be termed, 16 17, is held stationary, and its inner or receiving end is situated within a channel, 18, formed on the inner side of the end disk 5 the light oil passing into this channel over the edge of the flange forming its inner side; or instead of their being a channel, 18, for the lighter oil there may be simply a cylindrical guard (corresponding to the bottom of the channel 18) to prevent any disturbing action caused by the oil entering the pipe 16 from extending outward and mixing the layers of oil.

The tarry or heavier part of the liquid may pass through direct openings 19 in the end disk 5 and near the shell 7 into a channel, 20, formed on the outer side of the end disk by means of an annular plate, 21, fixed to the shell 7 by means of angle-iron. The heavy liquid is delivered from the channel 20 by means of a stationary pipe, 22, with its inner receiving end dipping into the higher part of the annular current of liquid. This heavy delivery-pipe 22 is held by a plate, 23, which is adjustable in position by means of a screw, so that the entrance end of the pipe may be set in the best position, and the pipe 22 is arranged so as to lead the heavy liquid or tarry matter downward from the entrance end to the receiving-tank, this arrangement avoiding the difficulty of lifting or raising tar out of a machine. The annular plate 21, forming the outer side of the channel 20 for the heavy liquid, is made radially broad enough to retain all the liquid the vessel may contain when the rotation is stopped, and a valve or plug, or, by preference, a pair of diametrically-opposite valves or plugs, 24, is provided for emptying the vessel, as it cannot be conveniently started, except when empty. A tank (not shown) provided just beneath the machine to receive the emptied liquid is connected by a pipe to the inlet-pipe 13, and after the machine has been restarted the action sucks up the liquid from the tank. This sucking action can be availed of to raise the liquid to be operated on from a lower level.

The various parts of the apparatus may be modified or varied to some extent. Thus instead of placing the internal radial branches, 15, of the inlet-pipe 13 so as to feed in the liquid near the smaller end disk, 6, they may be arranged to feed it in about midway between the two end disks 5' 6', or nearer the larger end disk, 5', as in the modification shown in Figs. 3 and 4 at 15', and, as also shown in these figures, the lighter oil or liquid may be taken off from a channel, 26, formed on the outer side of the smaller end disk, 6', while the heavier oil or liquid is taken off from the channel 20, formed on the outer side of the larger end disk, 5', as in the first modification. The annular plate 27, forming the outside of the channel 26, is made to extend toward the center as far as the corresponding plate, 21, at the other end of the vessel.

In Fig. 4 the valves 24', for emptying the vessel, are shown as connected internally by rods 28 to eccentrics 29 on a spindle passing through the tubular shaft 9, which has a hand-wheel, 30, fixed on the outer end of it.

What we claim as our invention is—

1. A centrifugal separating apparatus comprising a rotary vessel with its axis horizontal and having a body with disks at both ends, the disks having bosses or shafts, an axial feed-pipe with rotating radial branches inside of the vessel, a channel or guard, and a stationary pipe with its entrance within such channel or guard for delivering the lighter oil or other liquid, and a second channel and stationary pipe projecting into it for delivering the heavier oil or other liquid, all substantially as described.

2. A centrifugal separating apparatus comprising a rotary vessel with its axis horizontal and having end disks, a feed-pipe, an annular plate, 21, outside one of the end disks to form a channel, 20, this end disk having openings near its periphery, a pipe projecting into the channel 20 to deliver the heavier liquids, and a pipe on the other side of the end disk to deliver the lighter liquid.

3. A centrifugal separating apparatus comprising a rotary vessel with its axis horizontal and having end disks, one of which, 5, has a channel, 18, on its inner side and is perforated near its periphery, an annular plate, 21, outside of the disk to form a channel, 20, a feed-pipe, an axial delivery-pipe projecting into the channel 18, and a delivery-pipe projecting into the channel 20, all substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

A. F. CRAIG.
ALEXR. NEILSON.
JAS. SNODGRASS.

Witnesses:
EDMUND HUNT,
DAVID FERGUSON.